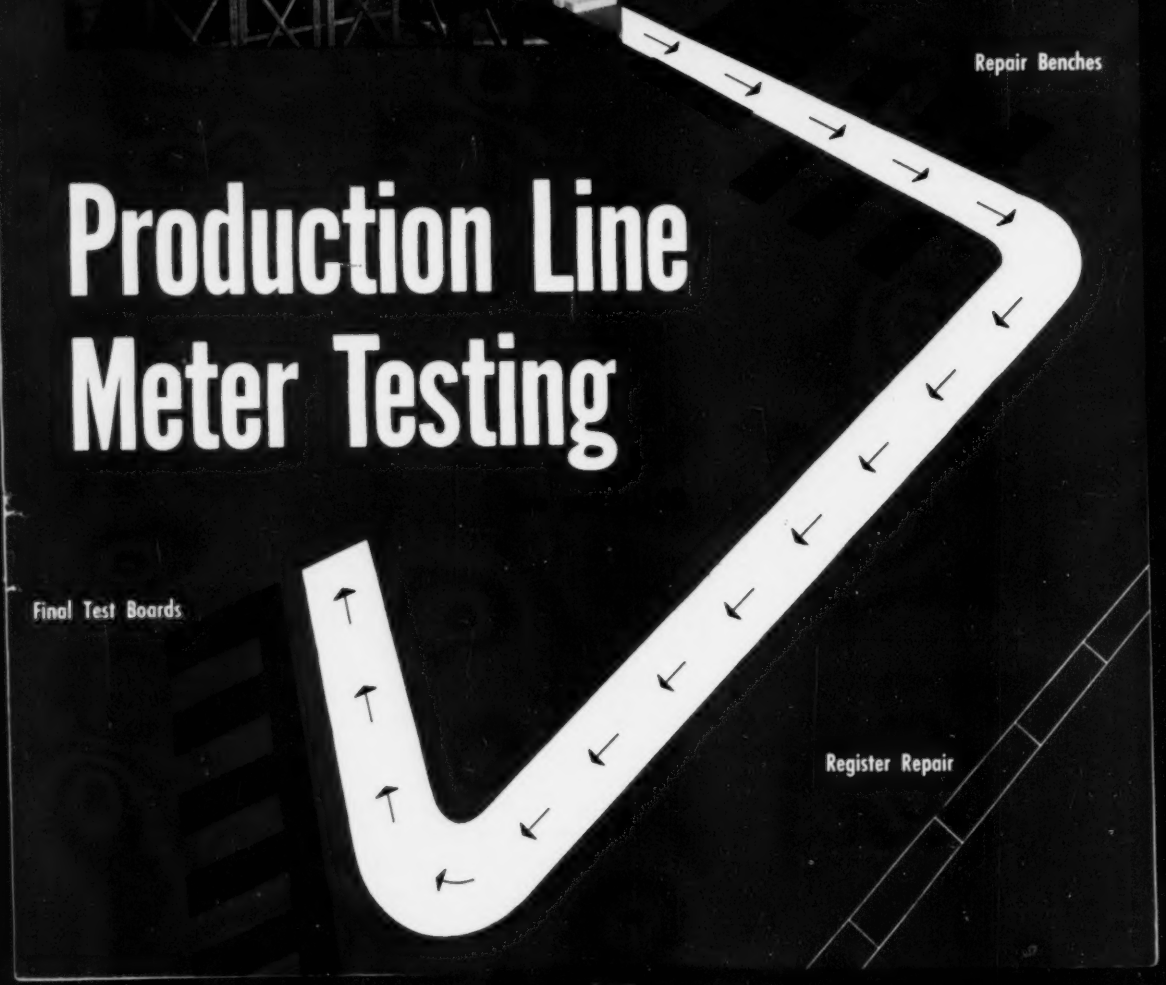
OCTOBER 20, 1952

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION

Production Line Meter Testing



NEW!

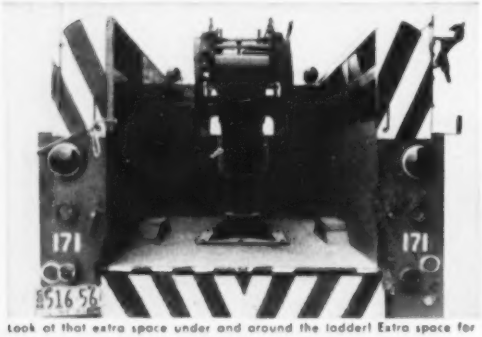
Murray PEDESTAL STYLE crows'nest

AERIAL LADDER PROVIDES *EXTRA* FLOOR SPACE

Lighter too!
Weighs only 725 pounds

This remarkable Murray Crows'nest has all the advantages of previous Crows'nest models, including semi-automatic inclination and rotational locking, plus extra space for extra loading.

Effortless, speedy operation plus utmost safety are other important advantages of the Murray Crows'nest. It's the *fastest, safest* aerial ladder on the market. Remember, the Murray Crows'nest is the *original* aerial ladder and the name—Crows'nest is a registered trade-mark.



Look at that extra space under and around the ladder! Extra space for loading, extra space for the operator.

FROM STOP TO TOP IN 15 SECONDS!

Slight pressure takes ladder out of riding position and raises it to desired inclination in one continuous *safe* operation. Pins snap into locking holes. Improved type of windlass extends ladder easily. All at comfortable working height —no stooping.

Even with the ladder rotated over side of the truck there is plenty of room for the operator. Rotates full 360° in 37½ inches. A boy can turn it.

PRACTICALLY NUMBERLESS COMFORTABLE WORKING POSITIONS.

The sturdy and safe 24" flat platform is adjustable to suit all inclinations—entire floor is level. Inclinations range 30° to 72°. Top guard rails are standard.

LOCKS AUTOMATICALLY INTO RIDING POSITION

On completion of work, the safety ladder locks are released and the downward path of the upper section is controlled with the brake of the windlass. When returned to riding position, it locks automatically into place. The ladder hugs the top of the cab to give lowest center of gravity.

Murray ...the original and *only* Crows'nest—operates fastest, safest and with the least effort. In addition, the new pedestal style leaves more room for loading. *Write to Ladder Division for complete data.*

Murray

MURRAY MANUFACTURING CORPORATION
1250 Atlantic Avenue, Brooklyn 16, New York

Service Entrance & Meter Equipment • Fully Magnetic Circuit Breakers • Switches (Types A, C & D) • Current Limiting Reactors • Crows'nest Aerial Ladders

Charles E. Oakes, Salesman

Charles E. Oakes, author of "Today's Challenge to Our Industry—Sell or Else," (p 102) is a "natural" for such a piece. His record as president of Pennsylvania Power & Light Co shows among many things that he is sales-promotion minded. If he were not, the company would never have done the sales job nor secured the reputation that it has.

Those who attend the annual sales conferences of Edison Electric Institute are familiar with the way this company from the "Pennsylvania Dutch" country has copped prizes.

Five out of Six Firsts . . . In the 1950 contest PP&L snagged the largest number of sales awards ever given one company in a single year. Competing in six classifications, it took five first's and a second. It followed in 1951 with two first's and an honorable mention.

It was PP&L which first gave recognition to the all-electric farm. It now designates them as Reddy Kilowatt Farms (EW, Sept. 1, p 38).

Selling Itself to the Public . . . Charlie Oakes also believes in selling his company to the public, both literally and figuratively. PP&L now has 75,000 stockholders, ninth largest number among electric utilities. And when the 75,000th stockholder was acquired, the lucky purchasers were given a three-day, well publicized tour of company properties (EW, Oct. 13, p 32).

Other public relations triumphs have been the "Portrait of Power" exhibit of 25 original paintings of the Sunbury Plant (EW, March 19, 1951, p 16) and the drive to get out voters for the coming election (EW, Aug. 25, p 72).

And its stockholders have the satisfaction of knowing that the company's annual report not only reveals the profitable activities of a growing organization but also is a report that will most likely win the Reddy Kilowatt Annual Report Contest or at least take an honorable mention.

It is often said that a company is but the shadow of a man. Judging by the selling job PP&L is doing, one can truthfully say, "Charlie Oakes must be a prize salesman."

Electrical World

Published for 78 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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FOR LONGER LIFE . . .

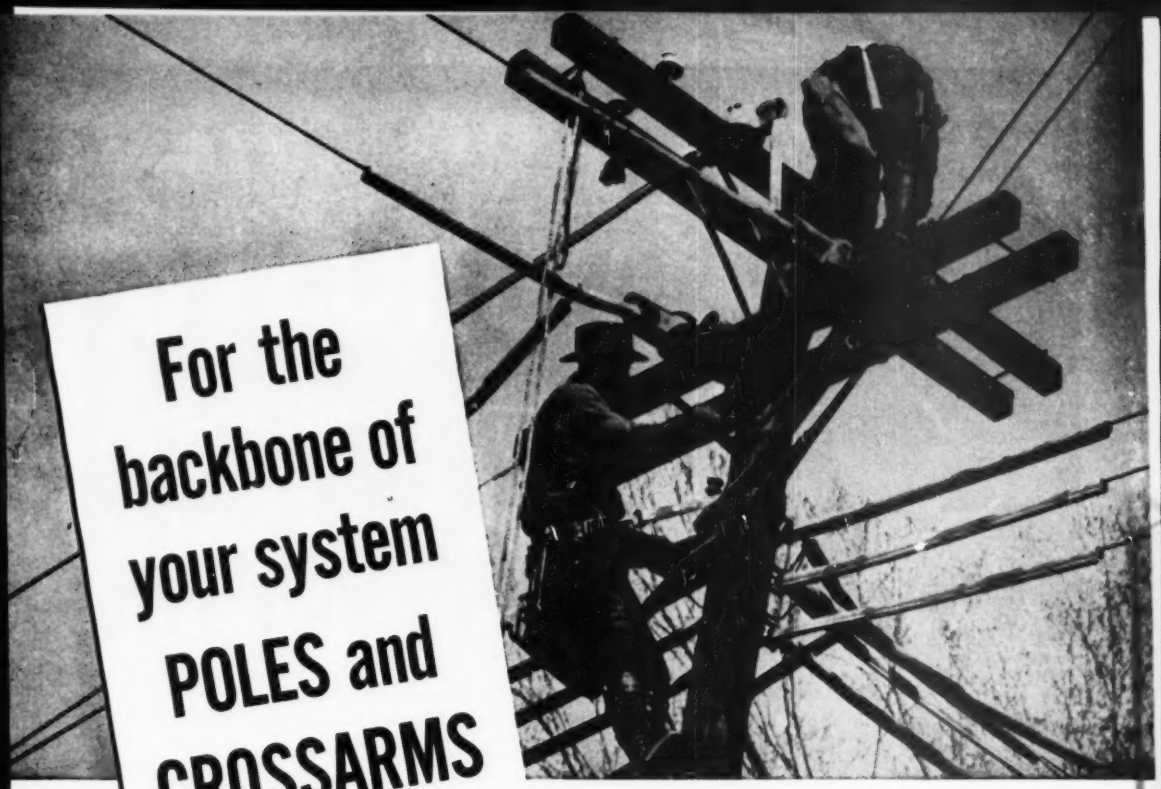
LOWER CORD COSTS FOR YOU

You've probably found it true too, that the service life of portable cords and cables — the true measure of cable economy — depends primarily on the toughness, lasting qualities and flexibility of the sheath. Today's Hazacords are the result of many years of Hazard and Okonite experience in developing portable cable and cords for unusually severe service in every type of industry.

Every Hazacord is protected with the specially developed Hazaprene ZBF Sheath. *It's cured under pressure in a continuous metal mold* which assures optimum vulcanization, maximum density, lasting toughness, a smooth, wear-resisting surface — and at the same time, ample flexibility is maintained. The Hazaprene ZBF Sheath is a time-proved neoprene compound with maximum resistance to oils, acids, chemicals, moisture and weather. In addition, it is highly flame-resistant — more than meets the flame test requirements of the Federal Bureau of Mines and the Pennsylvania Department of Mines. All Hazacords are insulated with tough, heat-resisting, long-aging rubber compound for full electrical protection.

It will pay you to get all the facts about Hazacord. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

HAZARD



For the backbone of your system POLES and CROSSARMS

Via GraybaR

The pole-line backbone that supports today's essential power lines needs seasoned strength and durability to do its job efficiently and at low maintenance cost.

That's one reason why power companies all over the nation choose Graybar for all their pole-line needs. They know that Graybar-distributed materials are always right for the job and stand up under abnormal stress of storms, ice, and snow.

POLES – Differing conditions lead to different local preferences. That's why Graybar distributes *all* types of poles – full-length, pressure-treated Southern Pine . . . full-length, pressure-treated Fir and Cedar . . . butt-treated Northern and Western Cedar.

All treated poles are carefully selected and processed to provide maximum strength and durability – plus the clean, smooth exterior surface required for city use.

CROSSARMS – Douglas fir crossarms via Graybar are selected and seasoned under rigid methods – are strong, long-lasting, and provide a wide margin of safety in the line.

POLE-LINE SUPPLIES – Graybar also distributes insulators, wire, cable, strand, hardware, tools, and hundreds of other needed pole-line supplies – all products of outstanding manufacturers.

To keep the backbone of your system strong, order your supplies from Graybar. You'll always get dependable items, and the nation-wide Graybar warehouse system helps assure the *fastest possible* deliveries under today's uncertain conditions.

Because Graybar is wholly owned by its operating and retired personnel, you can always expect an extra measure of personal interest in serving you. Feel free to call your local Graybar Representative for information on any electrical item . . . call your nearby Graybar Outside Construction Specialist for planning aid and technical advice. *Graybar Electric Company, Inc. Executive Offices: Graybar Building, New York 17, N. Y.*

148-9 6

Everything for your pole lines
Via GraybaR

IN OVER 100 PRINCIPAL CITIES

As with every other product, there can be weakling cables and robust cables. Weakling cables are those that can be classified as having anemia of the insulation. In other words, they do not have the insulation stamina to stand up under the electrical and physical conditions to which they will be subjected. It's this kind of cable that will haunt you.

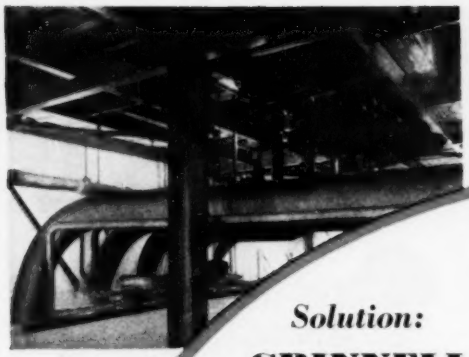
Simplex-ANHYDREX XX Cables come from a robust family. They have a guaranteed water absorption of only 15 milligrams of water when tested in accordance with U.S.C.G. specifications. They will not crack when exposed to severe ozone conditions. Simplex Anhydrex XX insulation is so robust that it will withstand these tests before or AFTER the insulation has been aged for 7 days at 250° F. (121° C.). Simplex-ANHYDREX XX Cables are recommended for operation at copper temperatures up to 176° F. (80° C.) in either wet or dry locations.

Here is an insulation that doesn't ask for special favors. It's the kind of insulation you should have on your important feeder, network, and station cables that operate in the voltage range of 2,000 to 17,000 volts. These cables won't haunt you.

Want to know more about this robust insulation? Simply send your request to the address below.

SIMPLEX-ANHYDREX XX

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge 39, Mass.



Main steam piping at Salem Harbor Station of New England Power, 1000° F and 1450 psi, supported by Grinnell Constant Support Hangers.

Problem:

PIPING THAT GROWS...

Solution:

GRINNELL ENGINEERED HANGERS

Eight . . . nine . . . ten inches of thermal deflection! That's not a bit uncommon in today's high temperature, high pressure systems. Very hard-to-come-by, though, is the skill necessary for dealing successfully with suspension problems resulting from *"piping that grows"* . . .

Large manufacturing facilities, expert technicians, and a lot of down-to-earth practical knowledge are needed.

Grinnell is America's No. 1 supplier of pipe hangers and supports, because Grinnell combines modern manufacturing with expert background knowledge gained during a century of piping specialization. Grinnell has developed hangers and supports for *every* piping need, from the simplest to the most complex. Grinnell, and Grinnell alone, can offer these advantages:

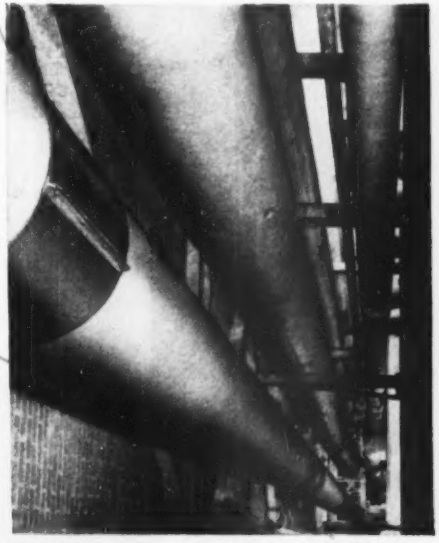
- Complete "start-to-finish" production facilities—including research, design, manufacturing, engineering and field service.
- Practical experience in every type of piping gained during the past 100 years.
- Coast to coast distribution—enabling "out of stock" purchases, anywhere.

Grinnell is always ready to cooperate with engineers and architects in the preparation of pipe suspension specifications. Call Grinnell for pipe hangers and supports.

GRINNELL MODEL L CONSTANT SUPPORTS maintain full safety factor in high temperature, high pressure systems. 3 physical structures accommodate maximum travel requirement of 2½, 5 and 10 inches; 16 sizes collectively cover numerous load ranges between 131 and 19,530 lbs.

GRINNELL PRE-ENGINEERED SPRING HANGERS— maximum variation in supporting force per ½" of deflection is 10½% of rated capacity — in all sizes. 16 sizes available from stock — load range from 74 lbs. to 9000 lbs.

GRINNELL VIBRATION CONTROL AND SWAY BRACES— dampen vibration, oppose pipe sway and absorb shock. 3 sizes give full deflection forces from 200 to 1800 lbs.; have initial precompressed spring forces from 50 to 450 lbs. respectively.



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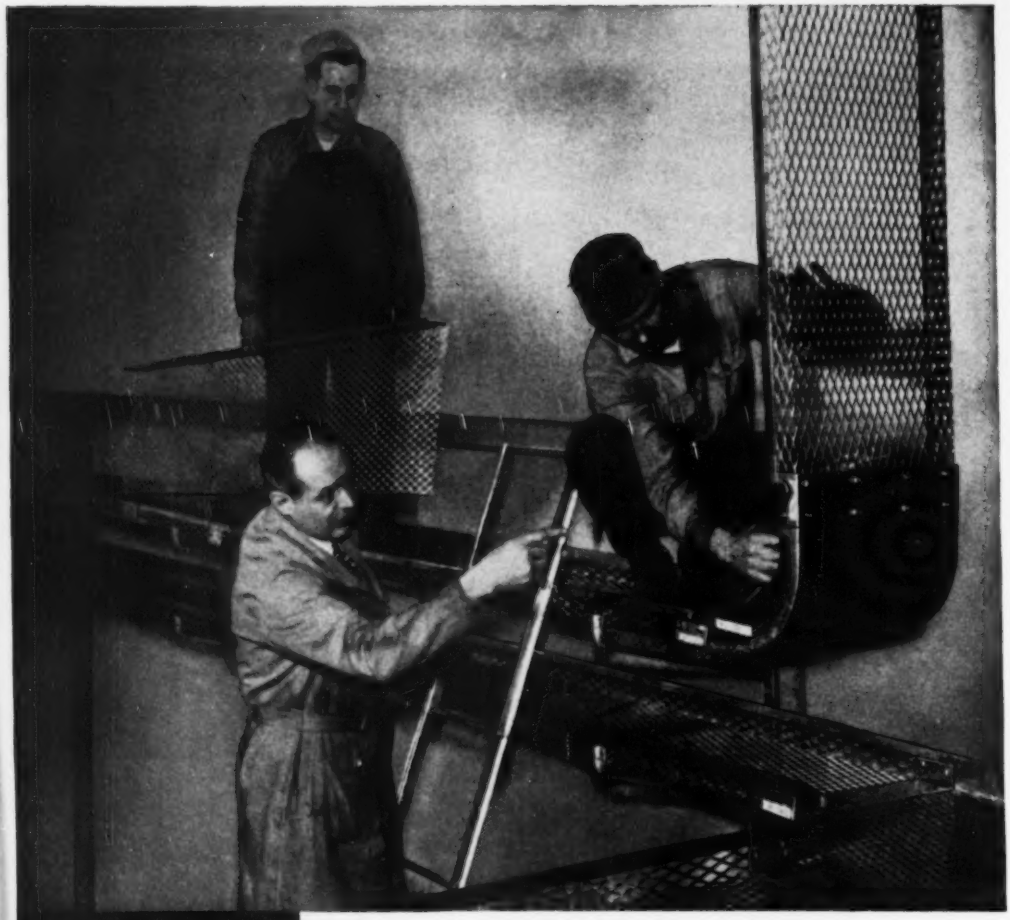

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PUMPS — Integral types from ¾ in. to 72 in. discharge and up.

See XO

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SQUARE D's DESIGN LEADERSHIP IN ACTION!

Climaxing nearly twenty years' design leadership in the residential circuit breaker field, SQUARE D now offers this new and remarkably simple type of mechanism. Study the sectional illustration below—see how simplicity of design (only 3 moving parts) provides accurate, positive operation! See how this same simplicity gives you every worthwhile operating characteristic you want in a circuit breaker—without cost penalty!

QUICK-MAKE, QUICK-BREAK at no extra cost and without the use of coil springs. The spring shown merely positions handle—has no function in breaker operation.

Positive Operation insured by action of handle cam directly against contact arm. No spring coupling.

AUTOMATIC RE-LATCHING Trips to "OFF." Circuit restored simply by moving handle to "ON."

Compact 15-20 ampere, single pole units are only ½" wide. 15-20-30-40-50 ampere, double-pole are only 1½" wide, yet accommodate the larger wire sizes.

AMBIENT COMPENSATED at no extra cost. Additional bimetal automatically regulates operation to surrounding atmospheric conditions—prevents needless tripping.

Thermal-Magnetic 2-way protection against heavy overloads and short circuits.

SHOCK RESISTANT Simplicity of design, light weight moving parts, and new type spring loading—all combine to make breaker unusually resistant to vibration or shock.

Plug-In Mounting for easy, fast connection to line bus. Steel reinforced, positive pressure clip has been performance-proved on millions of Square D products.

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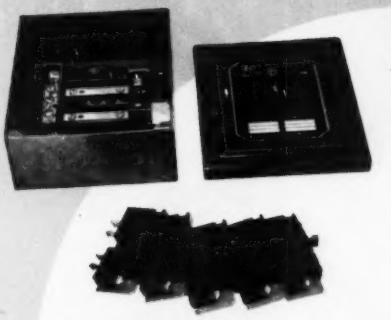
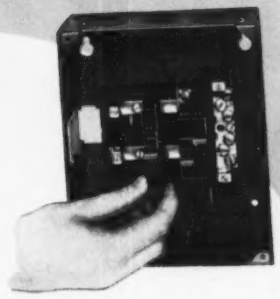
LOAD CENTERS

SO EASY TO STOCK, ASSEMBLE AND INSTALL . . .



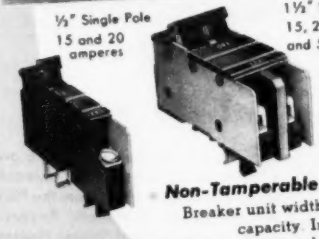
Only 3 components
(1) box and interior, (2) plug-in breaker units, (3) flush and surface covers.



Easy to Install Breaker units simply "plug-in" on bus bars. Load terminals out in front for easy wiring. Straight wire terminal connections—no looping.

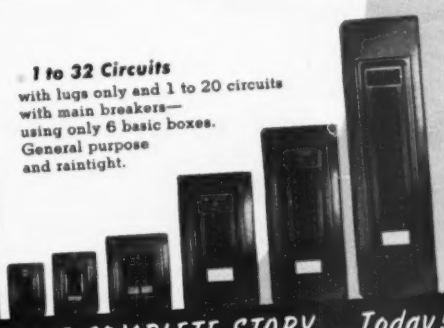
½" Single Pole
15 and 20 amperes

1½" Double Pole
15, 20, 30, 40 and 50 amperes



Non-Tamperable Assembly
Breaker unit width varies with capacity. Impossible to interchange high capacity ratings with smaller sizes.

1 to 32 Circuits
with lugs only and 1 to 20 circuits with main breakers—using only 6 basic boxes. General purpose and raintight.



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Team-work between the utility companies and appliance manufacturers in the promotion of "growth" or "low saturation" appliances is essential to assure increased residential revenue. Added revenue from major appliances must come from the NEW APPLIANCES such as Dishwashers—Disposalls®—Freezers—Automatic Dryers—Ironers—Automatic Washers—as well as from Electric Ranges and Water Heaters. Most other appliances are for replacement and produce little or no new utility revenue.

With a tradition of close cooperation and understanding of utility problems, Hotpoint is taking the lead in effecting a transition which gradually but surely is bringing complete electric living nearer a reality. In addition to its aggressive promotion of today's low-saturation appliances, Hotpoint leads in the promotion of all-electric kitchens and home laundries, and in building acceptance for a full and complete line of electrical servants—not for just one or two appliances.

To aid in creating a better balanced and more profitable domestic electrical load, we now have available for you new studies on "Balanced Revenue Through Selective Selling" and "Consumer Survey Plans for Retail Salesmen." You can get full information on these studies by writing the Utility Division, Hotpoint Co., 5600 West Taylor Street, Chicago 44, Illinois.

Hotpoint Co.

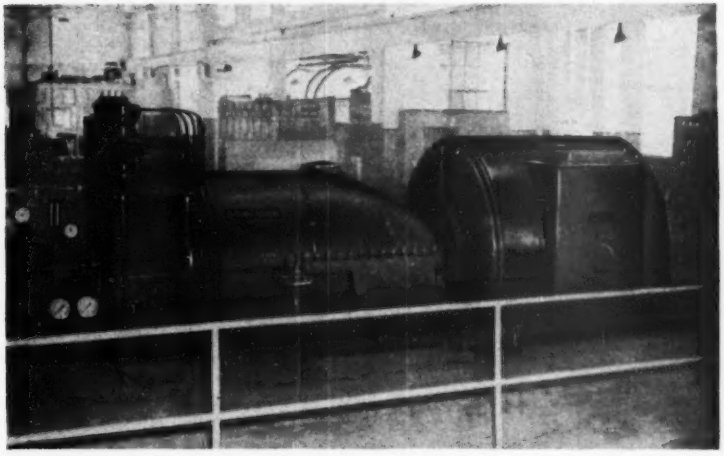
(A Division of General Electric Company)
5600 West Taylor Street, Chicago 44, Illinois

progress report

on

MOORHEAD, MINN.

1940 kw Output —9,142,000
1950 kw Output —25,805,700



The City of Moorhead is Growing!

On October 31, 1952, this 6,000/7,500 kV turbo set, furnished by Brown Boveri Corporation of New York, starts its task of supplying additional power to Moorhead and its environs.

Here's another example of a wise decision to place equal importance on *thorough dependability, long life, low maintenance, service, substantial dollar savings* and *delivery* as factors in the purchase of turbo sets for small and large plants.

BROWN BOVERI

buy brown boveri . . . *it's better business!*

BROWN BOVERI CORPORATION
19 RECTOR STREET, NEW YORK 6, N. Y.

It pays to String Copperweld* OVERHEAD GROUND WIRES

You Get *Permanent Protection* for your transmission lines

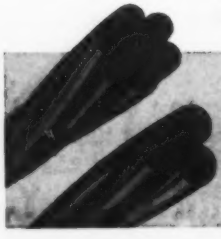
You can be sure of safe, economical, and permanent protection when you string Copperweld* Overhead Ground Wires atop your transmission lines. Copperweld's thick copper covering, inseparably molten-welded to the strong alloy steel core of each wire, provides the necessary electrical conductivity for relaying and for the dissipation of lightning discharges. Because this copper covering is corrosion-resistant, the rugged strength of every wire in the strand is constantly protected. This permanent high strength assures ample mid-span clearance for the most severe operating conditions.

If you're looking for transmission line protection that pays for itself in longer life and less maintenance, install Copperweld Overhead Ground Wires. You'll be glad you did for years to come. Write today for your copy of the Copperweld Engineering Data Book.

*Trade Mark

COPPERWELD STEEL COMPANY, *Glassport, Pa.*

SALES OFFICES IN PRINCIPAL CITIES



Copperweld* NON-RUSTING

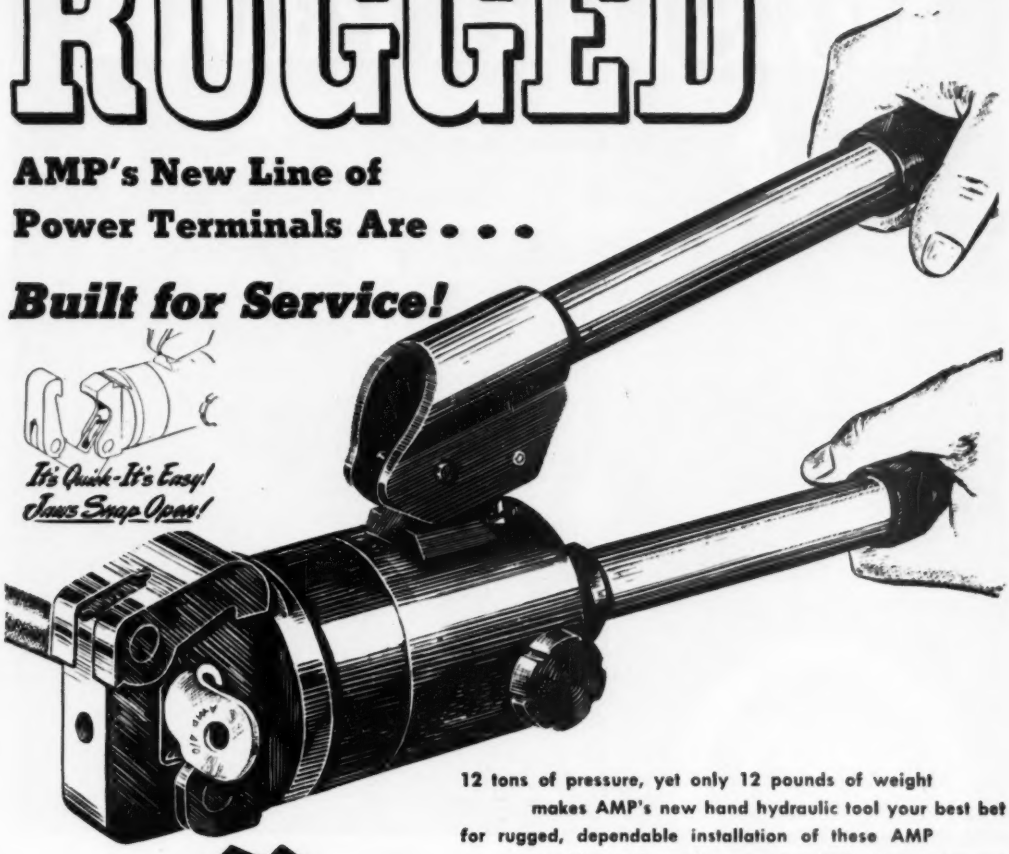
OVERHEAD GROUND WIRES

Last The Life Of The Conductors They Protect!

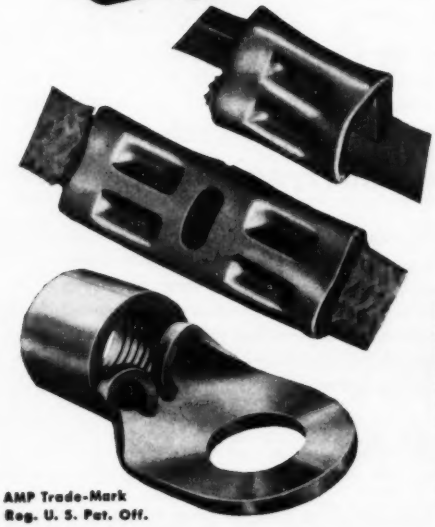
RUGGED

AMP's New Line of Power Terminals Are . . .

Built for Service!



It's Quick-It's Easy!
Jaws Snap Open!



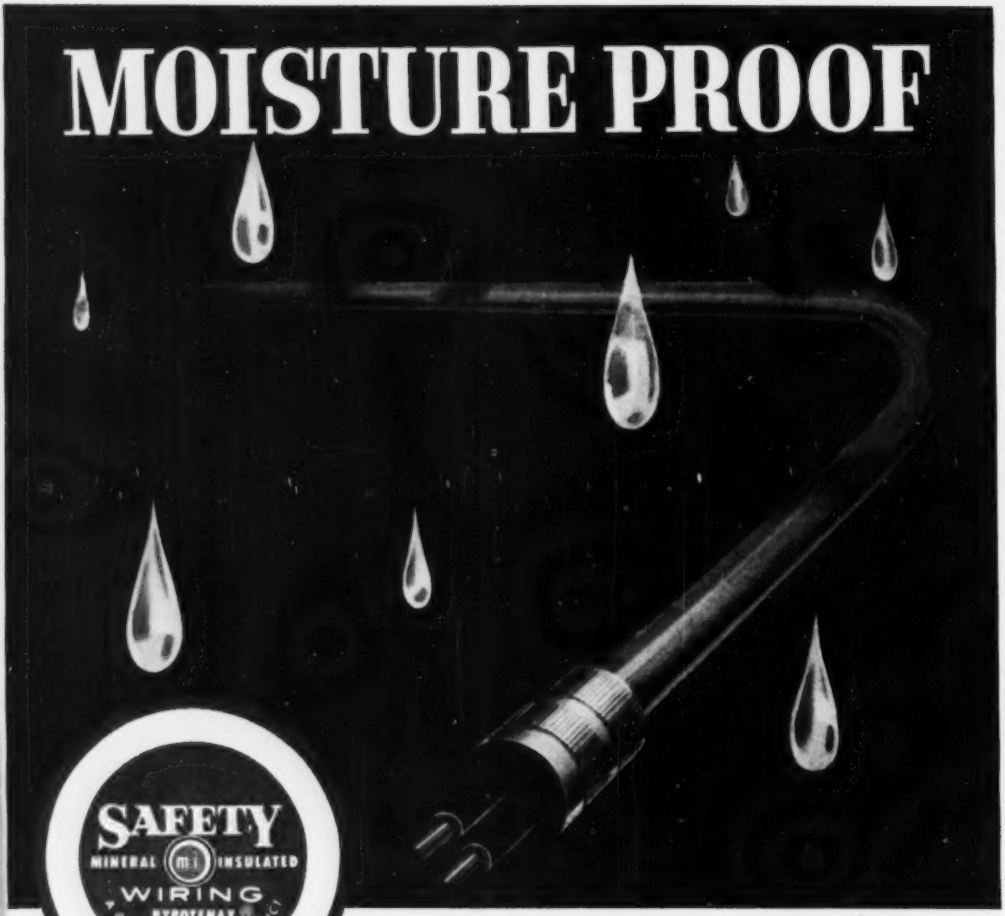
AMP Trade-Mark
Reg. U. S. Pat. Off.

12 tons of pressure, yet only 12 pounds of weight makes AMP's new hand hydraulic tool your best bet for rugged, dependable installation of these AMP *precision-engineered* power terminals. Terminals and connectors are available in all ranges from #8 to #4/0. DESIGNED FOR USE ON ALL SHAPES OF WIRE: SOLID, STRANDED, SQUARE, OVAL, OR COMBINATIONS! Dies snap in and out easily. Tool automatically releases when crimping pressure is reached. Can be used with either pole strap or bench stand if desired. WRITE FOR SPECIAL POWER TERMINAL CATALOG.

AMP

AIRCRAFT-MARINE PRODUCTS INC.
POWER TERMINAL DIVISION
1200 Paxton Street, Harrisburg, Pa.

MOISTURE PROOF



SAFETY m.i. WIRING

is completely impervious to moisture, oils, most acids and alkalies... and is unaffected by extremes of heat or cold

- ✓ OUTLASTS STRUCTURE IN WHICH INSTALLED!
- ✓ ONE-STEP INSTALLATION!
- ✓ NO VAPOR PASSAGE!
- ✓ RIGID YET FLEXIBLE!
- ✓ NO HEAT DETERIORATION!

Sealed within a continuous copper sheath, the insulation of a Safety m.i. Wiring System affords complete immunity from deterioration in dielectric properties normally caused by the presence of gases, water, oil, solvents or accumulated condensation in confined spaces. It offers other important advantages, particularly where absolute protection against service interruption is essential. Send today for the informative brochure, "20 Questions & 20 Answers on Safety m.i. Wiring System".

"More Power to You" ®

GENERAL CABLE
CORPORATION

EXECUTIVE OFFICES: 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK • SALES OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES

Adequate thermal capacity

FOR SHORT TIME HIGH CURRENTS

A BIG FEATURE OF THE R&IE TYPE "A" AIR SWITCH

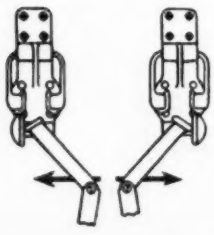
600 Ampere Blade and Jaw

1200 Ampere

"Because you demand your switches reliable"... that is why R&IE Hi-Pressure Contact Switches are fortified against operating hazards.

Check the Facts

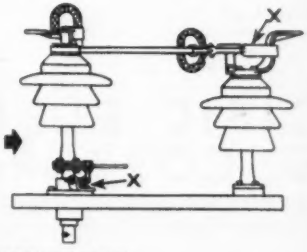
Electrical and thermal capacities have been substantially increased by the new Hi-Pressure Contact jaw design of the R&IE Type "A" Horn Gap Switch. These jaws now have silver-surfaced copper contact tips brazed to U-shaped beryllium copper jaw springs with provisions for 2 contact points on the 600 amp. switch jaws and 4 contact points on the 1200 amp. jaws. This use of copper and beryllium copper provides high conductivity, high strength and resiliency. In addition, jaws now have maximum mass back-up areas for heat absorbtion at the contacts.



Other Features...

Reversible blade and jaw permit clockwise or counter-clockwise operation—a sliding, wiping action that makes a new, clean surface with each contact operation.

Note how ice-locking troubles are lessened by the wide clearances (X) provided at jaw assembly and under the crank. Note, also, that terminals are located at the same level from base for straight-line bus connections.



R&IE EQUIPMENT DIVISION

I-T-E CIRCUIT BREAKER CO.

GREENSBURG, PA.

The Check List

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC SWITCHING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

Reduced Maintenance
Improved Reliability

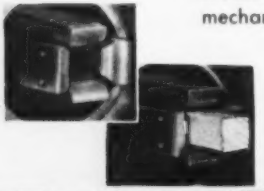
PACIFIC ELECTRIC
Type RHE
CIRCUIT BREAKERS

115, 138, 161 kv — 3 or 5 cycles
196/230 and 230 kv — 3 cycles
to 10,000,000 int. kva (ASA)
at 161 and 230 kv
(Also other types, 7.5 kv and up)

Electrically and Mechanically Trip Free
ASA, AIEE, and NEMA STANDARD

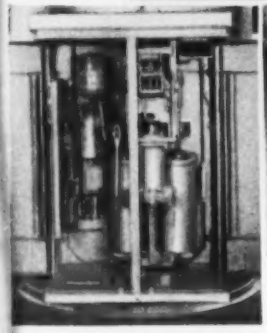
Applicable Standards of ASA, AIEE, and NEMA assure electrical performance of any breaker that meets such requirements . . . but *mechanical* construction, upon which maintenance cost and reliability largely depend, still remains subject to the manufacturer's design approach.

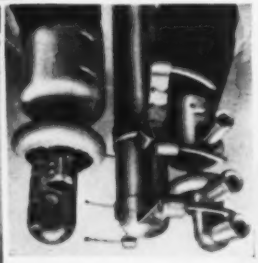
Pacific Electric solicits critical examination of its Type RHE breakers from both the electrical and mechanical standpoints.



At Left:
Sliding Shoe (finger) Contacts — Six Such Groups in Each Breaker (shown open and closed).

Below:
One-Piece Moving Contact Structure and Interrupters.





At Left:
Operating Mechanism with Oil-Hydraulic System.

Above:
Type RHE-64, 115 kv Circuit Breaker with Common-Base Mounting.

PACIFIC TYPE RHE Breakers embody mechanical features that contribute to low maintenance cost and improved reliability of the breaker and the substation at which it is located. These features assume increasing importance as the upward trend of wages and service salaries continues.

Only One Moving Element in the Tank—Opening accelerating springs and shock absorbers are outside of the tank. As no parts in the tank require service adjustment, maintenance within the tank is largely eliminated. Entrance bushings are under negligible mechanical stress.

Vested Sliding Shoe (finger) Contacts—Self-cleaning: arc foot-points confined to portions of surfaces that do not carry load current; minimizes contact dressing.

Oil-Hydraulic Restoration of Closing Energy—Simple; reliable; lack of tightness of valves does not prevent normal operation—it only slightly increases time for restoration of full energy.

Anti-Friction Bearings—Sealed and lubricated at time of assembly, require no further attention. Lubrication points practically eliminated.

Easy Manual Operation for Load Switching—If control power is lost, the breaker may be closed manually. Then two minute's hand operation of the oil pump prepares the mechanism for O-C-O after fault, or for manual closing after manual opening—all at rated speeds.

These and other advanced features are described in Catalog 585.

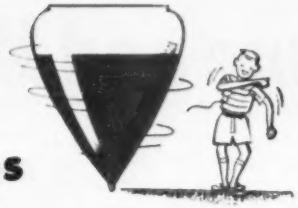
PACIFIC ELECTRIC MFG. CORPORATION

5815 THIRD STREET, SAN FRANCISCO 24, CALIFORNIA • 4500 HARRISON STREET, GARY 10, INDIANA

Since 1906

SALES OFFICES or AGENCIES in PRINCIPAL CITIES

Spinning...



fine for tops

but not for tapes

splices "stay put" with *BI-SEAL SELF-BONDING TAPE

You can depend on the "self-bonding" action of Bi-Seal to give you a permanent splice. Bi-Seal, when applied, fuses into a solid, moisture-proof mass of insulation that defies delamination and is completely impervious to "weathering."

Apply it on the smallest wire or the largest cable . . . wherever you use tape as a splicing medium (even at temperatures as low as –40°) and you are assured of complete and lasting protection against moisture, acids, alkalies, sunlight, corrosion, ozone and fungus.

OTHER ADVANTAGES OF BI-SEAL

- NO STICKY ADHESIVES . . . EASIER TO APPLY IN CLOSE CLEARANCES
- NO RIGHT OR WRONG SIDE . . . BOTH SIDES USABLE
- NO TACKY SURFACE TO PICK UP DUST OR FOREIGN MATTER
- WILL NOT TANGLE OR STICK TOGETHER DURING APPLICATION
- REQUIRES NO SPECIAL APPLICATION TECHNIQUES
- CAN BE STORED INDEFINITELY

* POLYETHYLENE BASED COMPOUND
PAT. NO. 2569540. REG. TRADE MARK

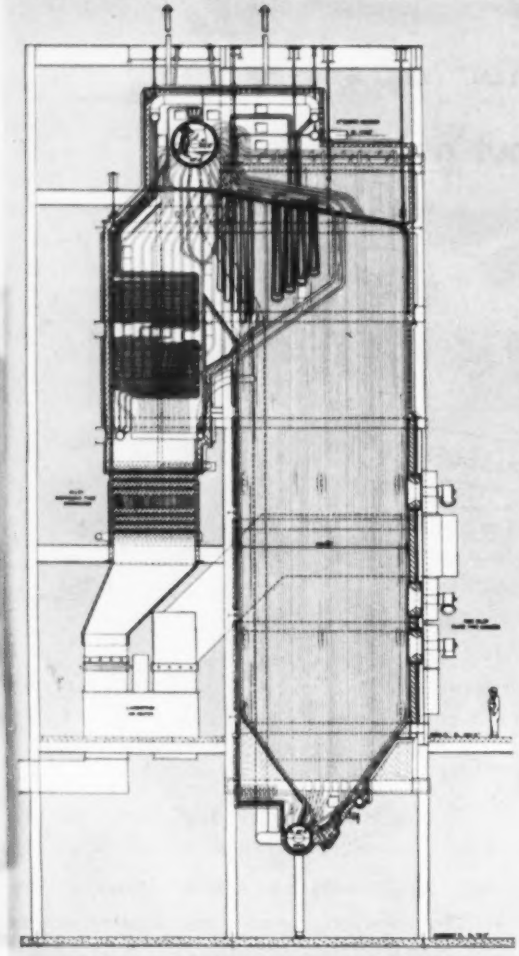
APPLIES FAST - STAYS FAST
BI-SEAL

BISHOP
MANUFACTURING CORPORATION
CEDAR GROVE, NEW JERSEY

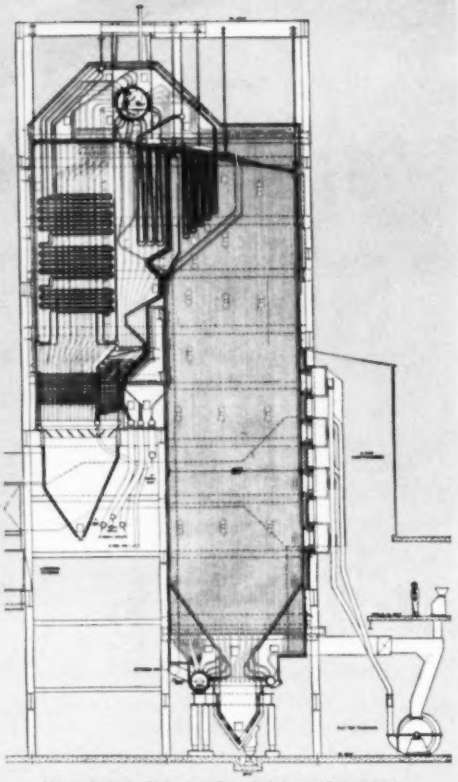
Attach this coupon to your company letterhead and mail to: **Bishop Manufacturing Corporation, Dept. EW, Cedar Grove, N. J.**
Please send sample and complete information on Bi-Seal to:

Name_____ Title_____
Company_____
Address_____
City_____ Zone____ State_____

More and More Public Utilities



South Carolina Electric & Gas Co., Charleston, South Carolina
400,000 lbs./hr. 1475 psig 955°F.
Fired initially by oil—future pulverized coal fired
Gilbert Associates, Engineers



Utah Power & Light Co., Salt Lake City, Utah
575,000 lbs./hr. 1700 psig 1000°F.-1000°F. reheat
Fired by Riley "50" Pulverizers
Bechtel Corp., Engineers

TRADE MARK Rx REGISTERED

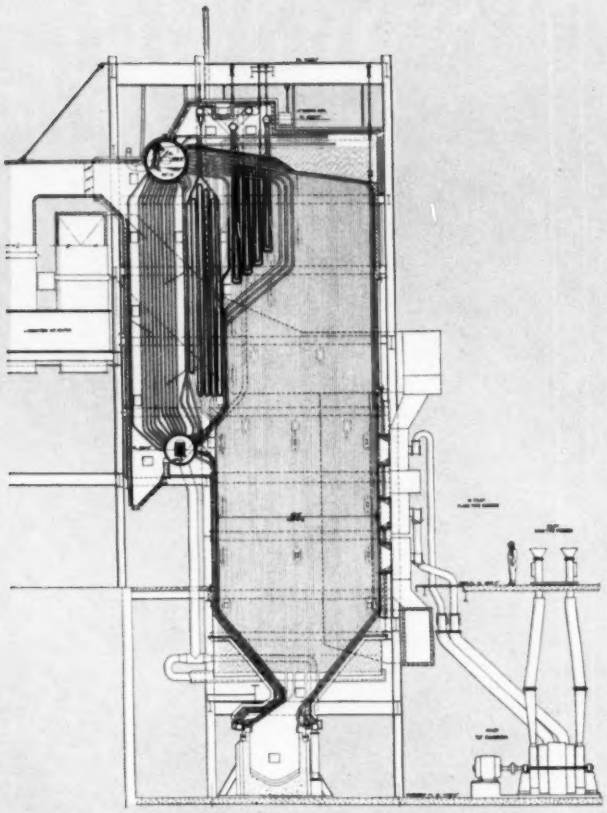
RILEY

STOKER CORPORATION, WORCESTER, MASS.

Boston New York Philadelphia Washington Buffalo Pittsburgh Cleveland Detroit Chicago
Cincinnati Charlotte Atlanta New Orleans St. Louis Kansas City St. Paul Tulsa Houston
Denver Salt Lake City Los Angeles Portland Seattle

BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • ECONOMIZERS

are SWINGING to RILEY Units



MONONGAHELA POWER CO.— THE POTOMAC EDISON CO., Albright, W. Va.
2-700,000 lbs./hr. 1050 psig 950°F.
Fired by Riley "50" Pulverizers
Sanderson & Porter, Engineers

A Few Recent Riley Units for Public Utility Plants

DEPARTMENT OF WATER AND POWER
CITY OF LOS ANGELES, CALIFORNIA
1,200,000 lbs./hr. 2075 psig, 1000°F. and 1000°F. reheat.

LOUISIANA POWER & LIGHT CO.
1,000,000 lbs./hr. 1725 psig, 1005°F. and 1005°F. reheat.

HOUSTON LIGHTING & POWER CO.
1,200,000 lbs./hr. 1700 psig, 1005°F.

SOUTHWESTERN GAS & ELECTRIC CO.
630,000 lbs./hr. 1050 psig, 1005°F.

MONONGAHELA POWER CO.
700,000 lbs./hr. 1050 psig, 905°F.

UTAH POWER & LIGHT CO.
575,000 lbs./hr. 1700 psig, 1000°F. and 1000°F. reheat.

CENTRAL ILLINOIS LIGHT CO.
600,000 lbs./hr. 950 psig, 900°F.

NORTHERN STATES POWER CO.
385,000 lbs./hr. 1500 psig, 950°F.

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY
460,000 lbs./hr. 1025 psig, 900°F.

THE POTOMAC EDISON CO.
700,000 lbs./hr. 1050 psig, 905°F.

IOWA ELECTRIC LIGHT & POWER CO.
300,000 lbs./hr. 975 psig, 910°F.

GULF POWER CO.
325,000 lbs./hr. 1000 psig, 900°F.

SOUTH CAROLINA GAS & ELECTRIC CO.
400,000 lbs./hr. 1475 psig, 955°F.

UTAH POWER & LIGHT CO.
620,000 lbs./hr. 1500 psig, 955°F.

IOWA-ILLINOIS GAS & ELECTRIC CO.
250,000 lbs./hr. 975 psig, 905°F.

PUBLIC SERVICE CO. OF INDIANA
400,000 lbs./hr. 1000 psig, 910°F.

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

Meeting the Nation's Growing Power Load

Lower Capital Costs through Higher kw Ratings

Your continuing search for better electrical service at reduced cost is the mainspring for our research and development activity. Take generation for example. As long ago as 1929, Westinghouse began pioneering on the large 3,600-rpm turbine-generator. This long-range program was based on our belief that higher-rated, high-speed machines would some day be needed.

Today, this long-range thinking stands justified. Many utilities have reached the stage where they must use units of 100,000-kw ratings and larger.

The Westinghouse 3,600-rpm turbine-generator with ratings up to 250,000 kw takes on added economic significance in view of today's rising costs. With higher-rated units of this kind, the over-all cost per kilowatthour can be reduced. The savings are reflected not only in apparatus cost, but in building and foundation costs as well.

Whether it's generating, transforming, regulating, protecting, measuring . . . any or all of the complex scope of utility service, Westinghouse is constantly thinking ahead about all your problems. How high ratings will go in the future is unknown . . . what we do know is that America's power appetite is growing. With this realization goes our responsibility to build more efficient apparatus . . . that is economical and reliable. J-97161

YOU CAN BE SURE...IF IT'S

Westinghouse

200,000-kw ratings are here

Philadelphia Electric Company has ordered from Westinghouse the largest single-shaft, high-speed turbine-generator unit ever undertaken; delivery is scheduled for 1954. This 3,600-rpm, triple-exhaust turbine is rated at 200,000 kw. The generator, using Westinghouse-pioneered, inner-cooled conductors, is rated at 235,294 kva. The generator will operate at 30-pound hydrogen pressure normal rating and will be good for 10% increased capability with 45-pound hydrogen pressure. Other higher-rated turbines are on order.

25-inch blades

The new 3,600-rpm turbine design was made possible largely by the use of Westinghouse-pioneered 25-inch blades. This is one of the most important of all Westinghouse contributions to higher-rated machines and higher steam temperatures and pressures; because the factor that determines the economic rating of any turbine is the size of the exhaust annulus, or the length of the last-stage turbine blade. The advance from blade lengths of 20 inches in 1935 to 25 inches today, represents one of the great triumphs of Westinghouse engineering.

Inner-cooled rotors

For large 3,600-rpm generators, Westinghouse has developed hollow rotor coils cooled by direct contact with hydrogen. Such coils will make it possible to increase ratings by as much as one half. Units larger than 200,000 kw are possible, while still maintaining industry-accepted short-circuit ratios and sufficiently high rotating mass for system stability.

Related generator developments kept pace

Generator developments matched turbine progress to make the new, large, 3,600-rpm, turbine-generator possible. For instance, there's the slotted rotor design, which eliminates double-frequency vibration; and flexibly-mounted stator assemblies to isolate the 120-cycle frequency vibration from the generator foundation. Another important advance is the development of Thermalastic® insulation for armature windings.

To learn what these developments mean to you, call your Westinghouse Electric Utility representative . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

"We Stopped Blowing of Main Fuses for Russell Creamery Company by Replacing Them With FUSETRON dual-element FUSES"

and FUSETRON dual-element FUSES provide 10 POINT PROTECTION

1 *Protect against short-circuits.

2 Protect against needless blows caused by harmless overloads.

3 Protect against needless blows caused by excessive heating — lesser resistance results in cooler operation.

4 Provide thermal protection — for panels and switches against damage from heating due to poor contact.

5 Protect motors against burnout from overloading.

6 Protect motors against burnout due to single phasing.

7 Give DOUBLE burnout protection to large motors — without extra cost.

8 Make protection of small motors simple and inexpensive.

9 Protect against waste of space and money — permit use of proper size switches and panels.

10 Protect coils, transformers and solenoids against burnout.

*Fusetron Fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

"...They seem very pleased with our work and we give a good deal of the credit to FUSETRON FUSES!"

ROY SPRINGER, Proprietor
ROSS ELECTRIC CO., Superior, Wisc.

Here are the Details:

"In the fall of 1947 the Russell Creamery Company, largest creamery in Superior, asked us to see what we could do to stop blowing of main fuses. They were having trouble; whenever a main fuse blew the whole creamery was affected.

"We carefully checked the load and found that it was unbalanced but that 600 ampere fuses were the size that should be used.

"The load was balanced and to be sure poor contact was eliminated, the clips in the switch were replaced. Then FUSETRON dual-element Fuses in 600 ampere size were installed.

"Since then Russell Creamery Co. has not had to call us once to replace a main fuse.

"Later Russell Creamery built an addition to their plant. We got the job. It was still not necessary to change the 600 ampere service.

"They seem very pleased with our work and we give a good deal of the credit to Fusetron Fuses."

Don't Risk Losses

One needless shutdown...
One lost motor...
One destroyed switch or panel
One burned out solenoid...
May cost you far more than replacing every ordinary fuse with a Fusetron dual-element Fuse.

MAIL THE COUPON NOW
for complete information about the All-Purpose Protection of FUSETRON Dual-Element FUSES.

BUSSMANN Mfg. Co. (Division of McGraw Electric Co.)
University at Jefferson, St. Louis 7, Mo.

Please send me complete facts about FUSETRON dual-element Fuses.

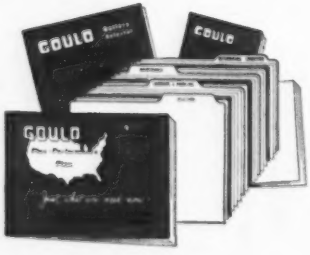
*Name*_____
*Title*_____
*Company*_____
*Address*_____
*City & Zone*_____ *State*_____ 1052

FOR BATTERY POWER with

LASTING POWER... *CHOOSE PLANTÉ*

Gould Planté—
The Aristocrat of
Stationary Batteries

You may be able to save up to 50% on maintenance costs throughout the life of your stationary batteries through the use of the Gould Plus-Performance Plan. Write Gould Battery Information Headquarters for full details.



Pure lead positive plates make Gould Planté batteries practically last forever. There's no antimonial impurities to contaminate negative plates and thus shorten battery life. Also, a huge reserve of pure lead continually replenishes spent active material in the positive plates. For amazing lasting power, there's *nothing* like Planté.

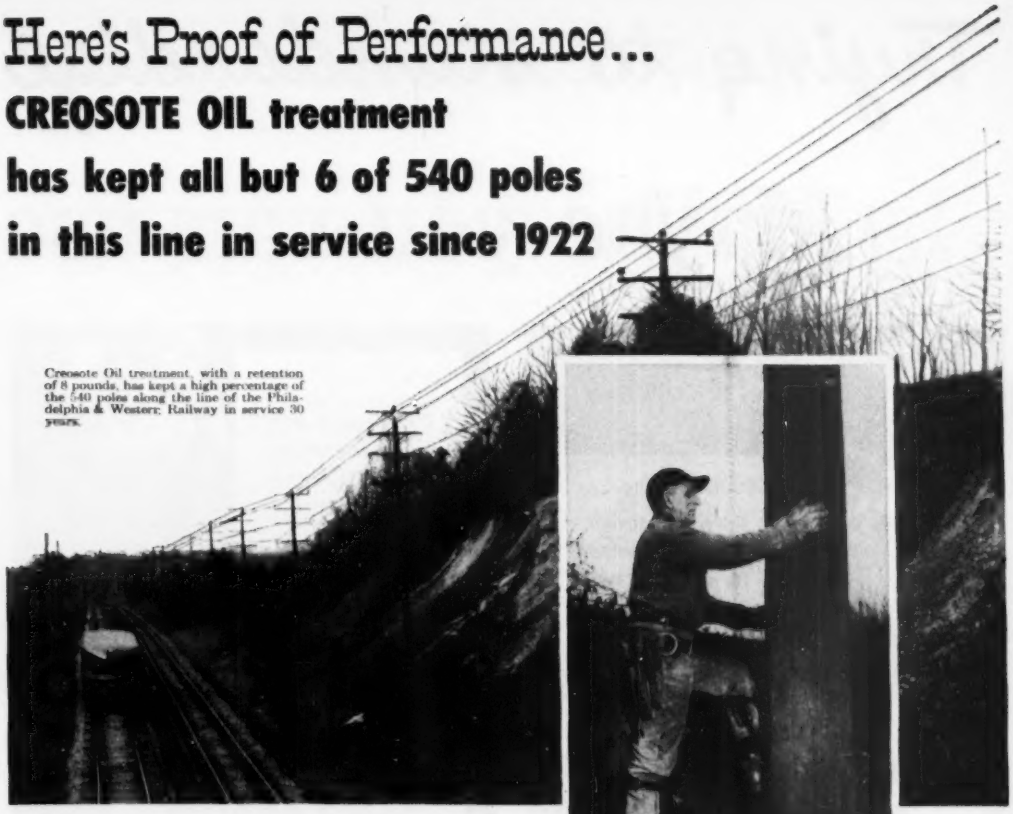
GOULD *Industrial Batteries*

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

Here's Proof of Performance...

CREOSOTE OIL treatment has kept all but 6 of 540 poles in this line in service since 1922



Creosote Oil treatment, with a retention of 8 pounds, has kept a high percentage of the 540 poles along the line of the Philadelphia & Western Railway in service 30 years.

Lineman Henry Daub of the Philadelphia Electric Company prepares to climb a pole on the line he helped to erect in 1922.

IN 1922, the Philadelphia Electric Company erected this 540-pole line along the tracks of the Philadelphia and Western Railway between Norristown and Llanerch, Pa. The Southern pine poles were given an 8-pound pressure treatment with Creosote Oil.

In 1940, the 376 poles on the Main Line—between Llanerch and Matsons Ford Road—were inspected. Two poles were removed due to decay, and three were moved for relocation. The next year, one pole was found decayed on the Schuylkill Division—between Matsons Ford Road and Norristown—and six were relocated.

The third inspection, in 1951, led to removal of three more poles and the marking of 15 more for future replacement. Relocation affected one other pole. Future inspections are scheduled every three years, and most of the poles are expected to last at least another decade.

Let records like these be your best guide when you choose a wood preservative. They are real *proof of performance*. They are the main reason why the wood preserving industry is using Creosote Oil at the rate of more than 200 million gallons a year.

Creosote Oil contains not one but many compounds whose toxicity and permanence ward off attack by such wood destroyers as termites, fungi, dry rot and marine borers.

When you use treated wood, be sure it is pressure-treated with U·S·S Creosote Oil. It's the product of continuous processing in the world's largest tar distillation plant. For complete information, contact our nearest Coal Chemical Sales Office or write United States Steel Company, 525 William Penn Place, Pittsburgh 30, Pa.

U·S·S CREOSOTE OIL

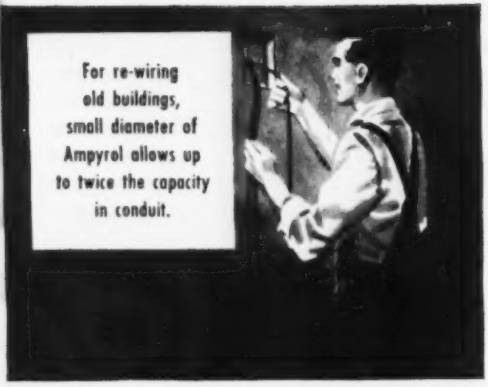
USS

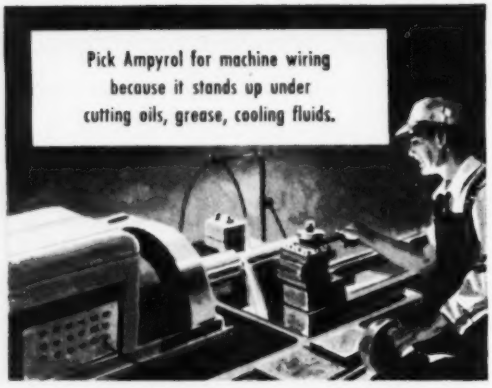
2-1413

UNITED STATES STEEL

Trying to standardize

Maybe you can use





A STANDARD Cable for every

- paper & varnished cambric cables
- asbestos cords and cables
- aerial, underground & submarine cables
- shovel & dredge cables

AMERICAN STEEL & WIRE DIVISION
USS
AMERICAN ELECTRICAL WIRE AND CABLE
UNITED STATES STEEL

U·S·S AMERICAN ELECTRICAL

your insulations?

Ampyrol for all jobs!

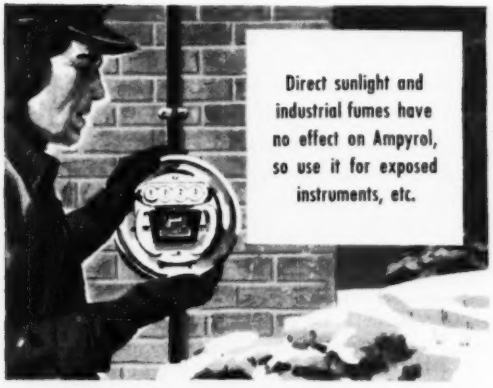
In the electrical industry, we've been developing insulations so fast that it's hard to keep track of them. But if you're looking for a special purpose insulated wire, you can usually use U·S·S Ampyrol, and get a better job in the bargain.

Ampyrol, for example, strips clean as a whistle. Many brilliant colors are available, and they run all the way through the insulation. It will not support flame yet it requires no protective armor or braid.

But the most unusual thing about Ampyrol is its almost unbelievable durability in the face of conditions that ruin ordinary insulation. Ozone concentrations that destroy rubber in a matter of minutes have no effect on Ampyrol. It withstands complete immersion in oil or naphtha for months on end. Months in a salt spray have no effect. It is unharmed by ultraviolet light, moisture, or fumes containing acids or alkalies.

In addition, for ordinary low voltage applications, very thin walls of Ampyrol can be used. It's a natural for instrument or switchboard wiring when space is at a premium.

Be sure you get all the facts on Ampyrol before you choose an insulated wire. You may be able to replace *several* types of insulation with this all-purpose wire. Send the coupon for quick information.



AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL COMPANY
GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

SPECIAL Job!

- oilproof portable cords
- plastic machine tool & building wire
- special purpose cords & cables

WIRE & CABLE

SEND THE COUPON

American Steel & Wire Division
Room EE-10, Rockefeller Building, Cleveland 13, Ohio

☐ Please give me more information on U·S·S Ampyrol.
☐ Have representative call.

Name.....
Title.....
Company.....
Address.....
City..... State.....

USS

UNITED STATES STEEL

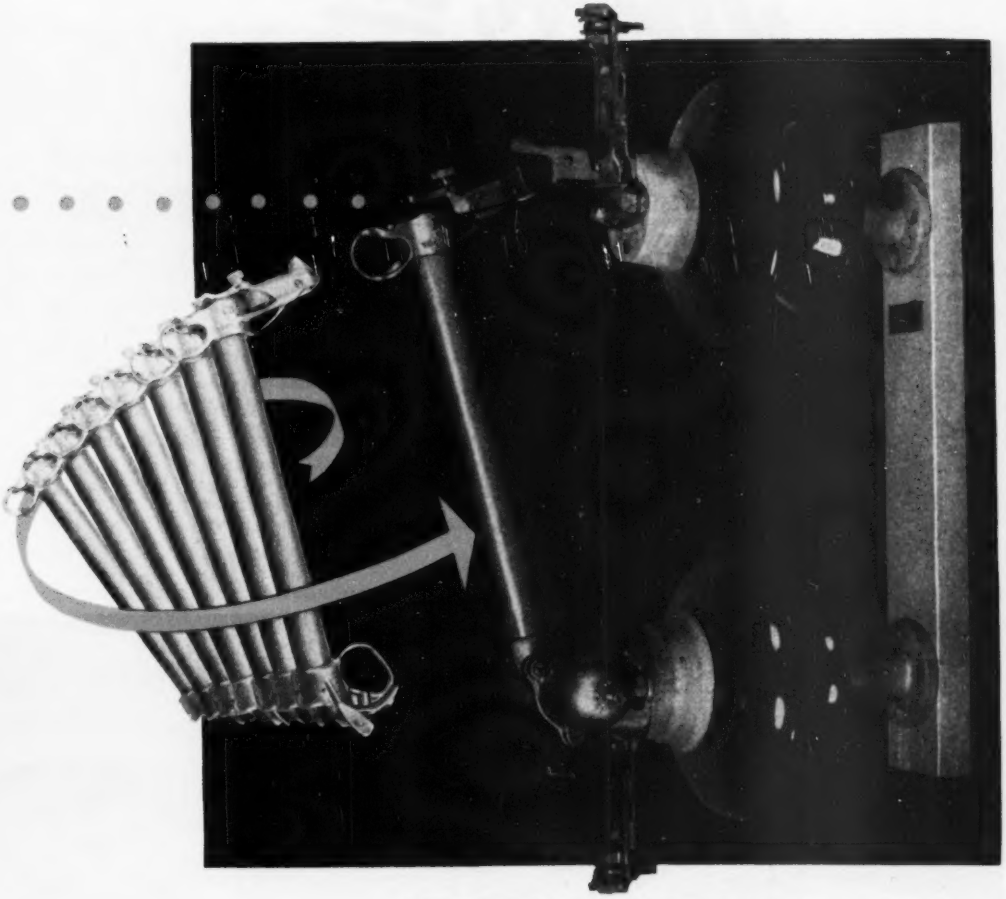
8 Power Fuses in one!

In view of present trends and the potentialities of increasing industrial efforts, one fact seems to be certain . . . system loads will continue to grow. This constant increase in the demands being made on systems for more and more power has long presented troublesome problems in the application of power fuses. The case where loads have outgrown the continuous current and short circuit capacity of installed fuses is common. Fuses chosen for one set of conditions may become entirely unsuitable when conditions change, and in many instances a complete new fuse installation becomes necessary. The capital outlay for reapplication of ordinary power fuses is unusually heavy when labor costs for installation, breakage associated with handling, cost for a complete new fuse, and loss of customer service must all be considered. Southern States offers a solution to these problems by providing a power fuse line that represents the maximum in standardization and interchangeability.

The "B" Series of outdoor, dropout, expulsion power fuses is designed to offer a standard fuse mounting in each voltage rating from 7.5 kv through 69 kv. Then by simply changing the fuse holder, each fuse mounting is easily adapted to a wide range of continuous current and short circuit duties. The fuse mounting classified as Type "B" is designed to function with three separate classes of fuse holders, each covering a different range of continuous current ratings and short circuit capacities as indicated in the table on the opposite page. These three classes have been designated LB, MB or HB indicating light, medium or heavy duty respectively. In all voltage ratings except the 69 kv rating, EIGHT combinations of continuous current and short circuit capacities are available. In the 69 kv rating six are available. The "B" Series affords convertibility over a wide range of load and short circuit capacities. Changing requirements can now be met economically at less trouble to you.

FOR COMPLETE INFORMATION WRITE FOR BULLETIN No. 52B

THROUGH INTERCHANGEABLE FUSE HOLDERS



Here's "On the Spot" adaptability to meet changing requirements.

	7.5 kv		15 kv		23 kv		34.5 kv		46 kv		69 kv	
	Amp Rtg.	Int. Cap.	Amp Rtg.	Int. Cap.	Amp Rtg.	Int. Cap.	Amp Rtg.	Int. Cap.	Amp Rtg.	Int. Cap.	Amp Rtg.	Int. Cap.
LB	50	2000	50	2000	50	2000	50	1000	50	1000		
	100	2000	100	2000	100	2000	100	1000	100	1000		
MB	50	4000	50	4000	50	3000	50	2000	50	2000	50	1500
	100	5000	100	5000	100	4000	100	3000	100	2500	100	2000
	200	6000	200	6000	200	5000	200	4000	200	3500	200	3000
HB	50	6500	50	5500	50	5000	50	3000	50	2500	50	2000
	100	9000	100	8000	100	6000	100	5000	100	4000	100	3000
	200	1,500	200	11,000	200	8000	200	7000	200	5500	200	4500

Southern States Equipment Corp.
HAMPTON GEORGIA

FROM 1 HP. UP...

At JOPPA, all motors

THE MOTOR LINE-UP AT JOPPA

83 on pumps of all types

20 on fans — induced and forced draft, and ventilating

6 on air compressors

69 on crushers, conveyors, coal feeders, etc.

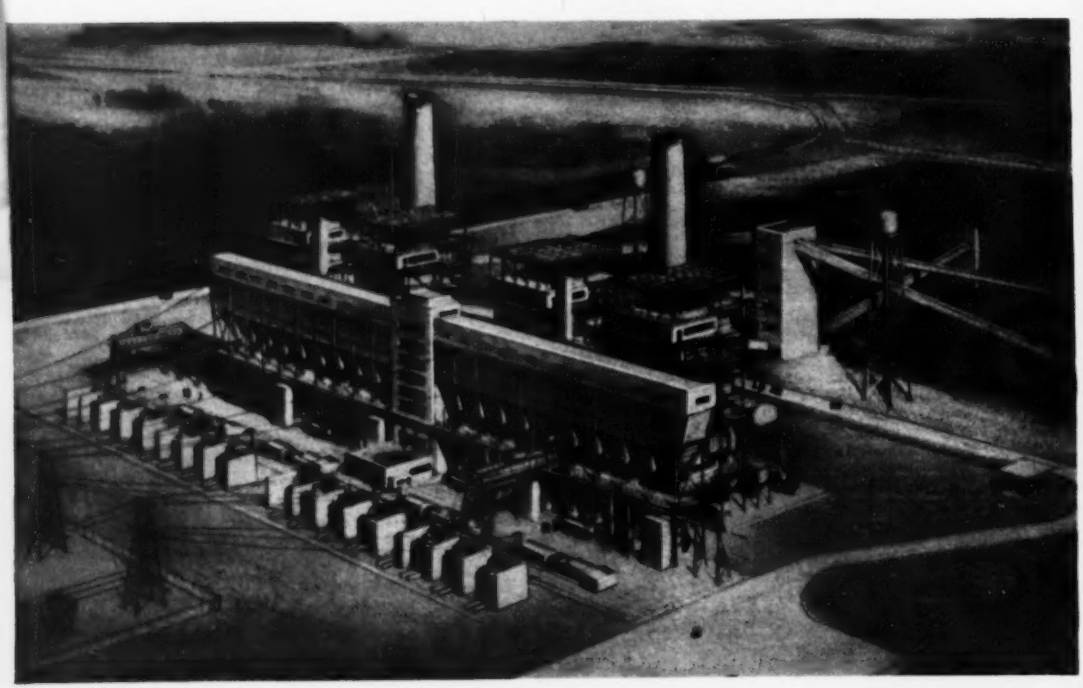
13 on winches, cranes, hoists

11 on miscellaneous service

MOTOR CAPACITIES IN HP include:
1, 1½, 2, 5, 7½, 10, 15, 20, 25, 30, 40, 50, 75, 100, 125, 150, 200, 250, 400, 600, 850, 1250, 2500.

MOTOR ENCLOSURES include:
dripproof, weather-protected (or outdoor splash-proof), totally-enclosed, non-ventilated, and totally-enclosed fan cooled.

MOTOR TYPES include:
synchronous, direct-current, squirrel-cage induction, and wound rotor induction.



are ELLIOTT!

The 652,000-kw Joppa Station, designed and constructed under the direction of Ebasco Services, Inc., New York, N.Y., is the largest outdoor steam-electric station ever to be initially conceived and built in one construction operation. Not only in capacity, but in construction speed too, Joppa sets a new record. Electric Energy, Inc., builders of the plant, represent the combined interests and efforts of the five major utility companies in the area to fill the vast power demand engendered by defense needs. Union Electric Company of Missouri, Central Illinois Public Service Company, Illinois Power Company, Kentucky Utilities Company, and Middle South Utilities, Inc., are the five companies who have pooled their resources to this end.

In this great new plant, all auxiliary motors are Elliott-built. Main auxiliary drives are served by sturdy "Fabri-Steel" motors produced by Elliott's Ridgway Division, while on other auxiliaries are many of the famous Crocker-Wheeler motors, built by the Crocker-Wheeler Division of Elliott Company.

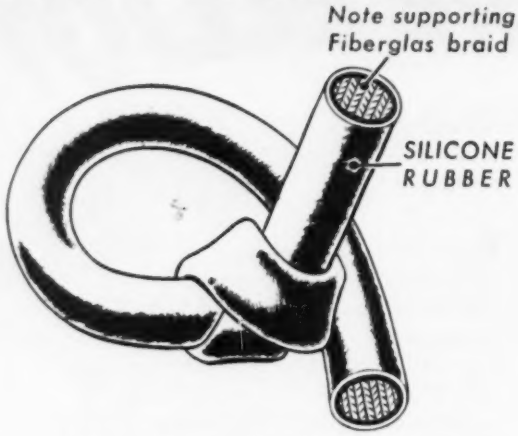
For full details on Elliott Crocker-Wheeler and Elliott Fabri-Steel motors, contact your local Elliott representative or write Elliott Company, Jeannette, Pa.

ELLIOTT Company

RIDGWAY DIVISION — CROCKER-WHEELER DIVISION

bend it . . . knot it . . . twist it . . . it won't crack . . .

BH "1151"



. . . stays flexible to protect electrical equipment

BH "1151" is a new tubing and sleeving which provides flexibility in Class H insulations. It can be knotted, twisted or bent without cracking, crazing or loss of dielectric strength.

BH "1151" withstands the stresses and strains of assembly, remains unchanged through continuous equipment operation in a temperature range of –90° F. to 400° F. Even after 15 minutes at 600° F. its dielectric and physical properties are constant.

BH "1151" is a long-lasting union of two great inorganic materials – Silicone Rubber and Fiberglas. It is extremely flexible when manufactured and keeps that flexibility for the life of the tubing. Electrical resistance is unusually high. It will resist inorganic acids, alkalis and most organic solvents. It will not support fungus growth.

BH "1151" meets all applicable Class H NEMA specifications.

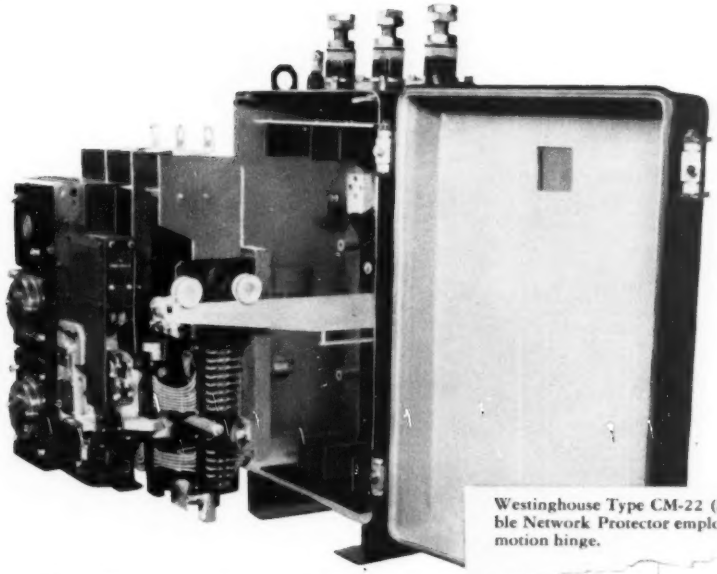
BH "1151" may be ordered in economical continuous lengths, or in 36 inch lengths. Short pieces, cut without wastage to individual specifications, may be had on special order. It is available in colors for circuit tracing and coding. Get all the facts – write for samples and data sheets today.

Address Dept. W-10

Bentley, Harris Manufacturing Co.
Conshohocken, Pa.

BH *Fiberglas** **SLEEVINGS**

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.



Westinghouse Type CM-22 (above) submersible Network Protector employs the new dual-motion hinge.

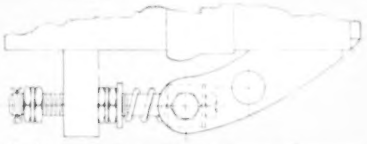
NEW, dual-motion hinge

SIMPLIFIES CLOSING OF NETWORK HOUSING

Now, the exclusive Westinghouse quick-opening, submersible Network Protector housing—which eliminated 26 to 44 bolts—has been further improved to simplify the operator's job. A new dual-motion hinge permits the cover to ride forward before it is swung open. This action relieves gasket pressure . . . leaves no restraining force to work against when closing the cover.

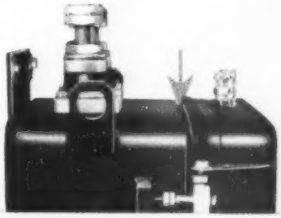
Your operators will like the simplicity and convenience of this Westinghouse "plus," as well as other housing features such as captive hardware, factory-adjusted stop nuts, and provision for hinging on either side. You'll like many additional, exclusive features built into all Network Protectors. For complete information, contact your Westinghouse Representative or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-60790



Dual-motion hinge detail. Factory adjustment for centering cover is independent of adjustment for gasket deflection.

Tubular Neoprene gasket compressed between machined edges on housing and cover provides a tight seal.



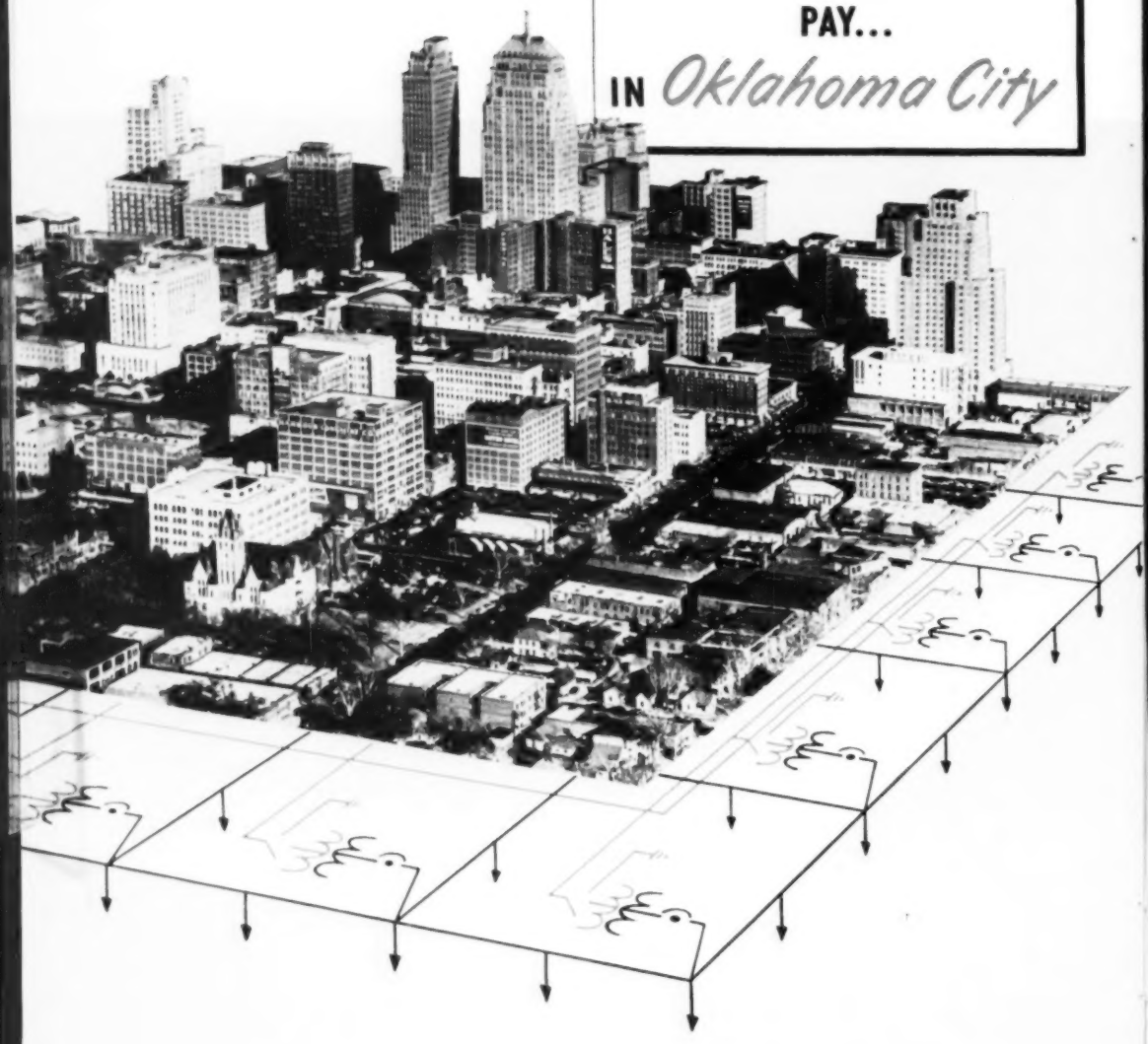
Top of network housing showing uniform gap between housing and gasket before tightening cover. This prevents the hinge side of the cover from "rolling" the gasket.

YOU CAN BE SURE . . . IF IT'S

Westinghouse

NETWORK PROTECTORS

NETWORK SYSTEMS PAY... IN *Oklahoma City*



OKLAHOMA CITY'S DOWNTOWN GROWTH . . . In 1926, the load on the network area of .083 square mile was about 4,000 kva. Since then, the business area has expanded to .19 square mile, and load has increased to 30,000 kva. This is 7½ times the original load and 2⅓ times the area.

Underground network proves long-term system solution!

Twenty-five years ago, the Oklahoma Gas and Electric Company took an important step for Oklahoma City. They embarked on a long-range system plan enabling them to comfortably and profitably meet a load that has grown 7½ times in an area that has more than doubled. So well did they plan, that even greater expansion can be accommodated without uprooting their basic system.

WHAT THEY HAD . . . In 1926, Oklahoma City's downtown area was served from an overhead 2400-volt, delta primary system with single-phase, 3-wire lighting and 3-phase, 3-wire power. In some cases, the load was such that an entire circuit served only one block. Naturally, conditions like this created problems. Pole space was needed for transformers . . . feeder capacity was inadequate . . . substation space and feeder routes were required. Overlooking appearance, an overhead system might have solved existing problems; but the Oklahoma Gas and Electric Company wisely anticipated future expansion and load growth.

WHAT THEY DID . . . Long-range system planning based on practical and economical objectives indicated the installation of an underground, low-voltage A-C Secondary Network System. The initial system was supplied from three 13.8-kv primary feeders through 10,800 kva of network transformers and associated network protectors, to a 3-phase, 4-wire, 120/208-volt secondary network, with primaries bus-regulated.

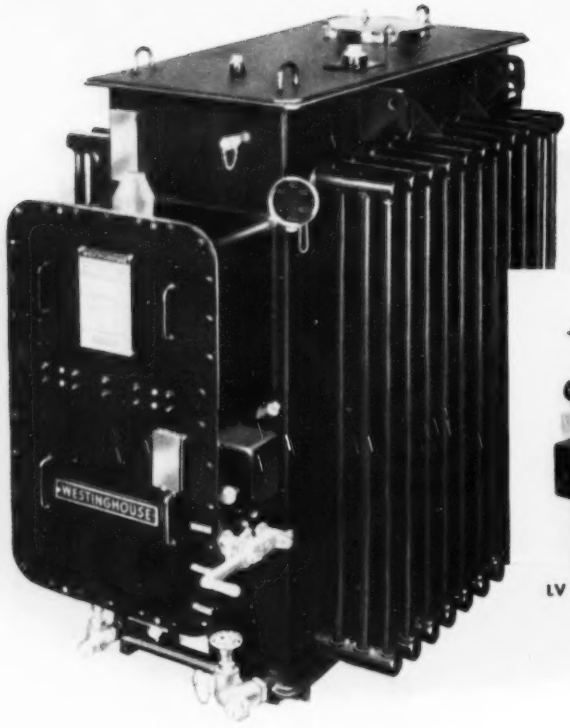
WHAT THEY NOW HAVE . . . That basic system installed 25 years ago has proved the most economical method of meeting increased load and area growth at every stage of Oklahoma City's expansion. At present, the system has five primary circuits, individual feeder regulation and 40,000 kva of installed network transformer capacity. What's more, there have been few voltage complaints . . . no outages, thanks to network operation . . . and maintenance expense has been almost negligible. System planning has enabled this utility to take full advantage of the latest improvements in the design and reliability of modern unitized electrical apparatus.

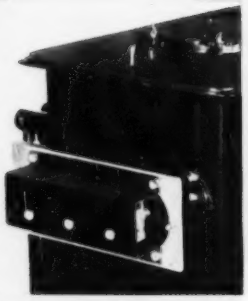
Decide now on objectives for your future system, or for making replacements to your present system. Our engineers are ready to help you in your network system planning. Call your nearby Westinghouse Office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-97157

YOU CAN BE SURE...IF IT'S

Westinghouse

NETWORK EQUIPMENT





LV Bushing Shipping Cover

QUALITY in the transformer ADDS RELIABILITY to the network

Everyone agrees that when you install a network system, you install *the best* for reliability and service continuity.

But the degree of reliability...or, more exactly, the freedom from maintenance, depends directly on quality in the transformers.

That's why Westinghouse Network Transformers have continuously wound coils of sliverless copper, to guard against hot spots, crystallization and pricked or scored insulation. That's why they're high-frequency tested, too.

In addition, Westinghouse Transformers are filled under vacuum, and have welded-on covers to assure a perfect seal. Finishes are not only baked for longer life, but bases are undercoated.

There are many other features such as the LV bushing shipping cover, shown above, that assure safe delivery of the quality built into Westinghouse Network Transformers. Your Westinghouse representative will be glad to give you full information, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70646

YOU CAN BE SURE...IF IT'S

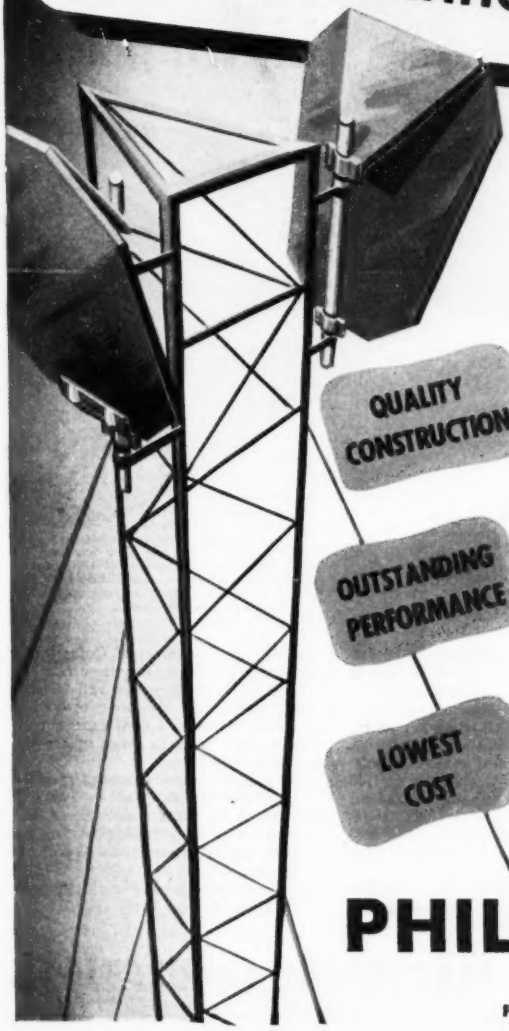
Westinghouse

NETWORK TRANSFORMERS

DON'T SETTLE FOR LESS!

PHILCO

Advanced Design MICROWAVE COMMUNICATIONS SYSTEMS



Again Philco leads the way . . . with Philco *Advanced Design* Microwave Communications Systems. Philco's years of experience in microwave development has produced a system unsurpassed in reliability, performance and economy.

QUALITY CONSTRUCTION

All components are of the finest quality, conservatively rated, insuring long life and economical operation and maintenance.

OUTSTANDING PERFORMANCE

A signal level 1000 times greater than normally required insures dependable service even under the most adverse conditions. Philco *Advanced Design* Microwave is flexible. The broadband microwave channel may be divided to carry up to 24 simultaneous 2-way telephone conversations . . . or be further divided for telegraph, teletype, telemetering, signaling or supervisory circuits.

LOWEST COST

Years of production experience enable Philco to produce microwave systems for the lowest possible cost consistent with highest quality. Future expansion can be easily accomplished with no loss of original investment.

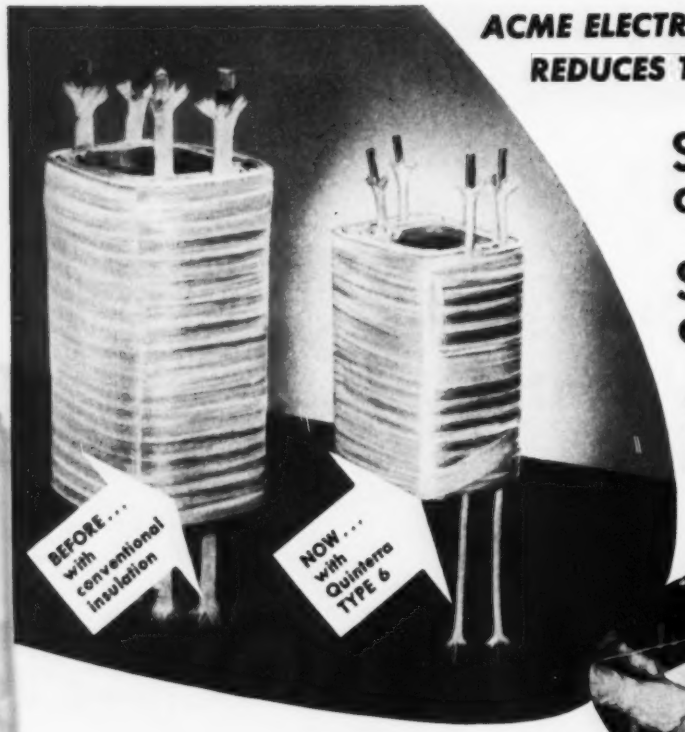
For dependable communications service 24 hours a day, every day of the year . . . *don't settle for less* than Philco *Advanced Design* Microwave Communications Systems!

PHILCO CORPORATION

INDUSTRIAL DIVISION

PHILADELPHIA PENNSYLVANIA

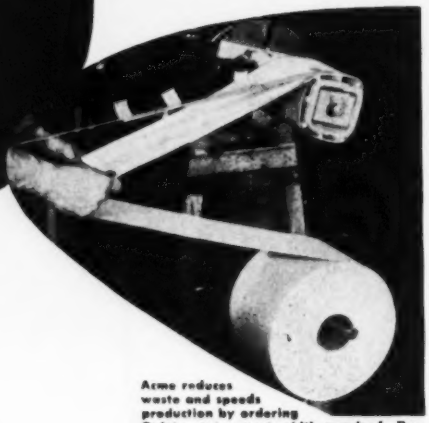
ACME ELECTRIC CORPORATION
REDUCES TRANSFORMER SIZE



Saves 40% on steel...

Saves 42% on copper...

Saves 44% on weight...



Acme reduces waste and speeds production by ordering Quinterra to exact width required—Production efficiency has been increased and waste has been reduced to an absolute minimum – without equipment changeover – by using Quinterra Type 6, factory-cut to Acme's dimensional specifications.

—by insulating coils with

Quinterra® TYPE 6

the purified asbestos electrical insulation

How have these tremendous savings in critical materials, weight, space, and production time affected the quality of Acme transformers?

The manager of Acme's Dry Type Transformer Division advises that not a single failure in operation of an Acme Quinterra-insulated transformer has been reported in the two years that they have been produced. Since several thousands of these units have been manufactured in this time, their quality is evident.

Here are the reasons why this Johns-Manville purified asbestos insulation has helped the Acme Electric Corporation, and many other well-known manufacturers, turn out better products and at the same time lower production costs.

Quinterra Type 6 possesses high thermal stability and lasting dielectric strength. It is a twin-ply, polyvinyl, acetate-treated, purified asbestos insulation with a dielectric strength of 300 VPM. Even when its saturant is baked out by continuous exposure to 200 C, it retains the inherent dielectric of the base sheet which is at least 200 VPM . . . and it remains a dielectric up to 400 C.

Type 6 has high mechanical strengths because it is made by combining and calendering two layers of Quinterra together into a dense, smooth-surfaced insulation. Its good tensile and bursting strengths enable operators to achieve favorable production rates. Further economies result from its large square-foot-per-dollar coverage.

If you are a manufacturer of magnetic or resistance devices, Quinterra Type 6 . . . or one of the other Quinterras . . . may enable you to lower production costs and also to improve your product's performance. For samples and additional information, write to Johns-Manville, Box 60, New York 16, New York.

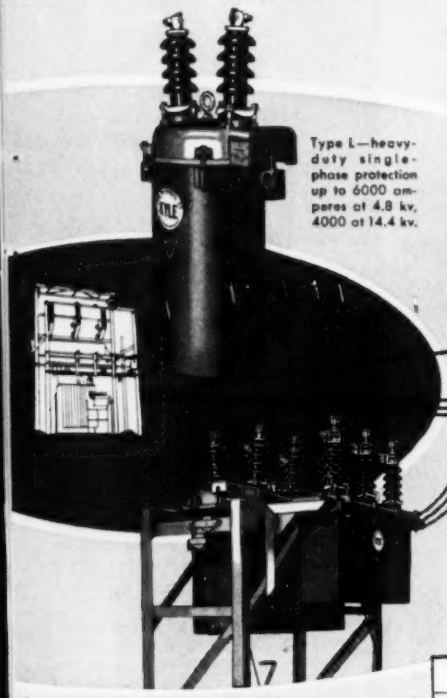
JOHNS MANVILLE PRODUCTS

Johns-Manville ELECTRICAL INSULATIONS

L-M now offers

Complete Automatic Recloser Protection

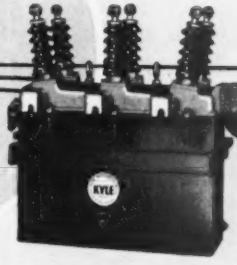
from Substation to Load—for single and 3-phase lines



Type L—heavy-duty single-phase protection up to 6000 amperes at 4.8 kv, 4000 at 14.4 kv.

Type E—intermediate duty—interrupts up to 2500 amperes at 14.4 kv, 1750 amperes at 23 kv.

Type H—interrupting capacity up to 1200 amperes at 14.4 kv.



Type R—heavy-duty 3-phase protection up to 6000 amperes interrupting capacity at 4.8 kv, 4000 at 14.4 kv. Available with ground trip solenoid.

Type 3H—3-phase protection up to 1200 amperes interrupting capacity at 14.4 kv. Available with shunt trip coil.

New Kyle heavy-duty Type R 3-phase recloser makes L-M first to offer a complete, coordinated line

As shown in the illustration, L-M now provides complete automatic protection from substation to user, in both single-phase and 3-phase recloser units.

The new Kyle Type R provides up to 100,000 kva interrupting capacity—up to 6000 amperes—ample for a good-sized substation or for heavily loaded feeders with high fault currents. The Kyle Type 3H completes the 3-phase line with up to 1200 amperes interrupting capacity.

In single-phase, the Kyle Type L provides up to 6000 amperes, for substation or heavily loaded feeders; the Type E covers the range from 1200 to 2500 amperes, and the Type H provides single-phase protection up to 1200 amperes.

Ask the L-M Field Engineer for information and bulletins on the complete Kyle line; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Complete Coordinated Automatic Protection from Substation to Load

Distribution Class Nominal Voltage Rating 14.4 kv BIL 95 kv			Intermediate Duty Nominal Voltage Ratings 23 kv BIL 150 kv				Heavy Duty Nominal Voltage Ratings 14.4 kv BIL 110 kv			
Single-Phase Type H Three-Phase Type 3H			Single-Phase only Type E				Single-Phase Type L Three-Phase Type R			
Rating Amps.	Min. Trip	Inter. Rating* 14.4 kv	Rating Amps.	Min. Trip	Inter. Ratings* 14.4 kv	23 kv	Rating Amps.	Min. Trip	Inter. Ratings* 4.8 kv	14.4 kv
5	10	150	5	10	200	125	....	....	....	....
10	20	250	10	20	400	250	....	....	....	....
15	30	375	15	30	600	375	....	....	....	....
25	50	600	25	50	1000	625	25	50	1500	1500
35	70	840	35	70	1400	875	35	70	2100	2100
50	100	1200	50	100	2000	1250	50	100	3000	3000
			70	140	2500	1750	70	140	4200	4000
			100	200	2500	1750	100	200	6000	4000
							140	280	6000	4000
							160#	320	6000	4000
							185#	370	6000	4000
							200**	400	6000	4000
							225#	450	6000	4000
							280#	560	6000	4000

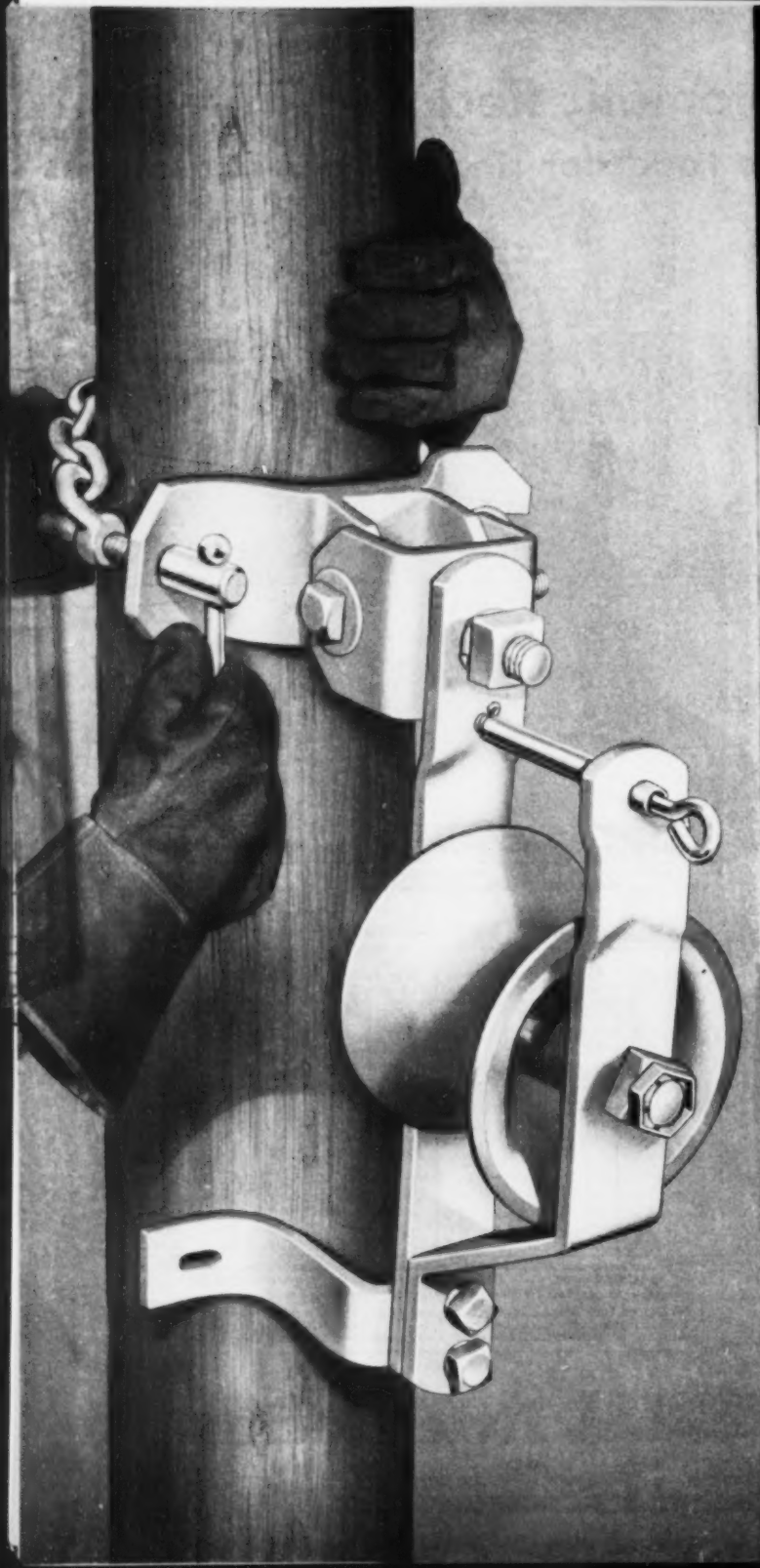
*Recloser interrupting ratings are based on the maximum test circuit X–R ratio of not less than 8 and the asymmetrical rating in total RMS amperes is 1.4 times the symmetrical ratings given in the table.
#Available in three-phase Type R only. **Available in single-phase Type L only.

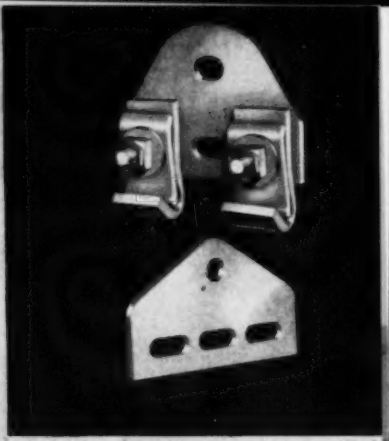
For Ground Fault Tripping: Type R heavy-duty 3-phase recloser is available with built-in ground trip solenoid and auxiliary current transformer. Type 3H is available with a shunt trip coil which may be used for ground fault tripping with suitable auxiliary equipment.

100

LINE MATERIAL Kyle® Reclosers

COMPLETE COORDINATED AUTOMATIC PROTECTION FROM SUBSTATION TO LOAD

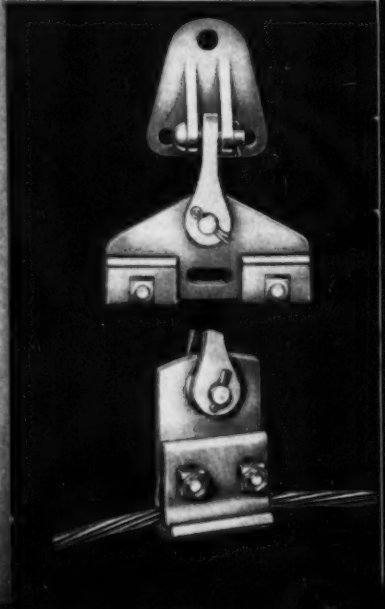


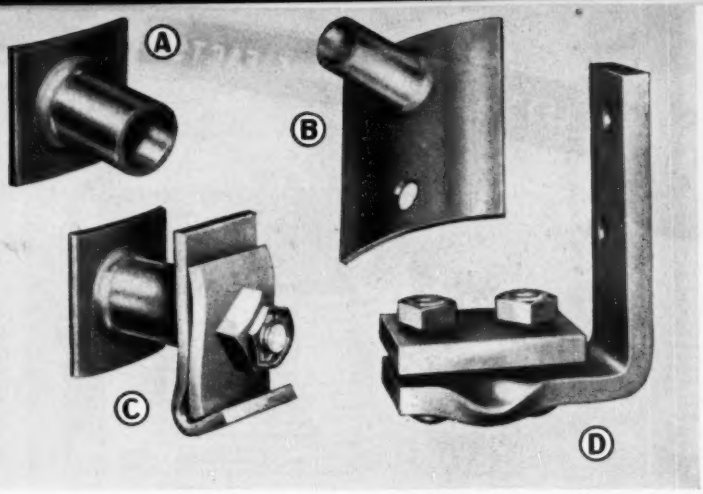


DOUBLE SUSPENSION HANGER clamps the messenger and may be used during stringing without tightening the clamps. The lower plate takes two or three one-bolt clamps. May be mounted as a unit with a machine bolt and washer spacer, or hung on the swinging bracket.

HINGED STRINGING PULLEY needed at each pole for economical, safe installation of aerial cable without damage to conductor insulation. Used on both tangents and angles, mounted just below the permanent messenger clamps, and removed after line is strung. Hinged joint between pulley yoke and pole frame permits pulley to swing out, keeping cable in the groove.

DOUBLE-SWING SUSPENSION BRACKETS made by combining standard parts. Below is the complete bracket; bottom illustration shows another type of hanger that may be substituted. Meets unusually severe conditions, where a free-floating bracket is needed. Assists in equalizing stresses on cable. Malleable pole plate is curved, to give extra rigid support; mounted with one machine bolt and two lag screws.

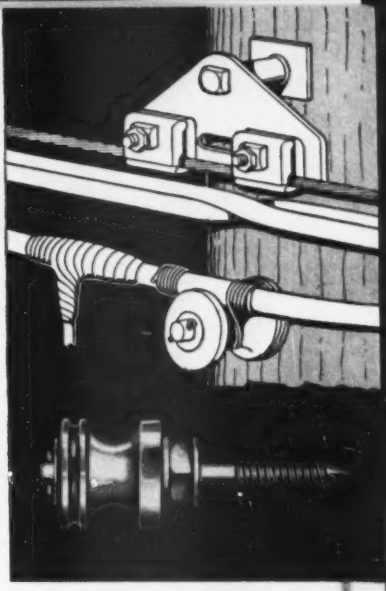




WASHER SPACERS used where standard machine bolts are used to mount messenger clamps. These spacers provide good bearing on the pole and keep cable from rubbing against the wood. Top left (A) is Flat Washer Spacer; at right (B) is Curved Plate Spacer for heavier cables, or longer spans; lag screw in lower hole keeps machine bolt from ovalizing hole in pole.

ONE-BOLT HANGER (C) shown with small washer spacer, used for small aerial cables such as street lighting and secondary cable. Rounded groove, flared edge. For ½" or ⅝" bolt.

UNIVERSAL MESSENGER HANGER (D) used for smaller size cable or where minimum clearance between cable and pole is required. Rounded groove has widely flared edges to prevent nicking the strand as well as to permit using this hanger on small angles as well as tangents. Forged open-hearth steel, hot-dip galvanized. Widths from pole 3⅛" and 4 3/16", and 4⅞" high, with offset holes for ⅝" machine bolt and ½" lag screw. Two ½" track bolts. For messenger from ¼" to 9/16".



INSULATED LAG SCREW BRACKET used to support the phase conductor where the conductor has been taken out of assembly—for example, when making a transformer tap. Standard ½" x 3" gimlet lag screw, with head and extension for a 3" dry or wet process spool insulator.

L-M Offers Service-Tested Materials to Simplify Aerial Cable Construction

DOUBLE UPSET EXTENSION BOLT provides, in one piece, a mounting bolt, spacer for pole clearance, and extension for mounting clamps. Eliminates stocking and assembly of separate parts, and thus saves more in time than it costs. Strong hexagonal section provides wrench hold. One-piece mild steel forging, ⅝" diameter, 6 to 18" long plus 4-inch extension.

To meet the special requirements of aerial power cable, Line Material some years ago began to study the needs for construction materials. The engineers, working alongside of the utility company specialists, soon found that standard pole line hardware was seldom completely satisfactory. And so a program of designing and testing special hardware was instituted. This program has continued, and as new requirements appear, new items are developed and tested.

L-M aerial cable construction materials are designed for maximum utility and interchangeability. These items can be fitted together in a variety of combinations to serve a number of purposes. The result is that with L-M aerial cable construction materials, you can solve almost any construction problem, regular or special, that may be encountered.

For help on any problem

Ask the L-M Field Engineer for information on the complete line of L-M aerial cable hardware, and a copy of Bulletin AC1; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

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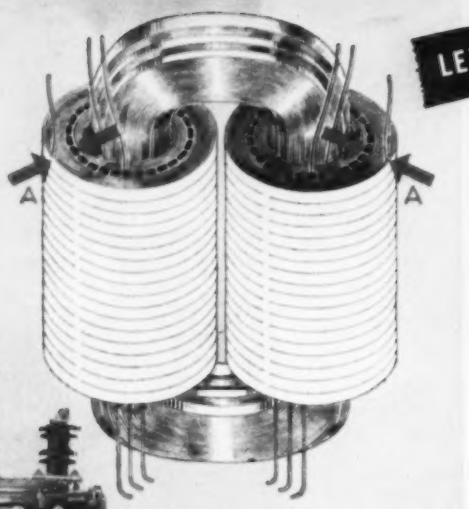
LINE MATERIAL

Line Construction Materials

Complete Coordinated Equipment for Distribution Today

LET'S LOOK AT THE FACTS



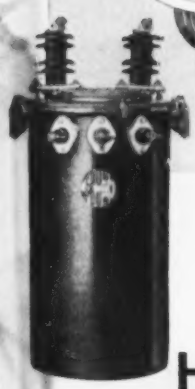


FIGURE 1. In Round-Wound transformers, primary windings are on the outside of the coils, providing ample creepage distance between high voltage leads and low voltage windings. Note the greater creepage distance "A" in this Round-Wound coil than "A" in the shell type construction shown in Figure 2.

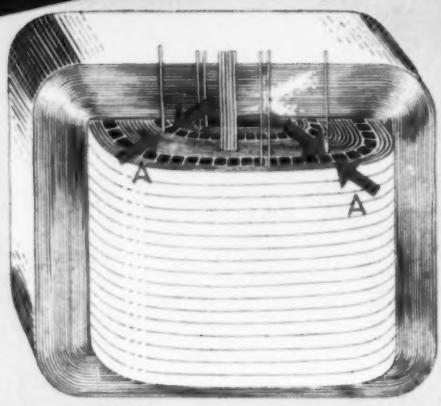


FIGURE 2. In the shell type of transformer, where the primary winding must be sandwiched between secondary windings, and are confined by core steel, primary leads are much closer to the secondary, resulting in far greater danger of flashover. Danger points are the short creepage distances "A" between the high voltage leads and the low voltage windings.

How L-M Round-Wound Design Provides Higher Impulse Level, Higher Short Circuit Strength

by **EARL J. KIRSCH**, Assistant Manager, Transformer Sales, Line Material Company

Both high impulse level and high short circuit strength are desirable characteristics in distribution transformers. A high impulse level will enable a transformer to resist lightning and switching surges of considerable magnitude. Short circuit strength will enable the transformer to withstand the great mechanical forces created by heavy short circuit currents.

High Impulse Level

Principal factors in attaining high impulse levels are the insulation between winding layers and the creepage distances between leads, windings, and frame. Lightning surges attempt to flash over or through insulation to the ground.

A particularly weak point in many transformers occurs across the end-coil surfaces where leads are brought out of the coils. As shown in Figure 1, it is a characteristic of the Round-Wound type of design that there is substantially more clearance between leads than is obtained with the one-coil shell type shown in Figure 2, where primary winding is often sandwiched between two layers of secondary, and more closely confined by core steel.

Core Versus Shell Type

In the L-M Round-Wound transformer, all of the primary winding is on the outside of the secondary winding. Leads are taken from the outside layer of the primary winding to the primary bushing, providing maximum creepage and flashover distances (Figure 1). In the shell type (Fig. 2), the designer must sandwich the primary winding between two layers of secondary to gain minimum acceptable clearance between the high voltage primary and the core, and to hold the impedance within acceptable limits.

Another problem is that surges tend to "pile up" on the end-turns nearest the bushing—which is why so large a percentage of burnouts occur at this point. Because of the design of the Round-Wound transformer, there is maximum separation of primary windings from ground, and maximum insulation between high and low voltage windings and between coils.

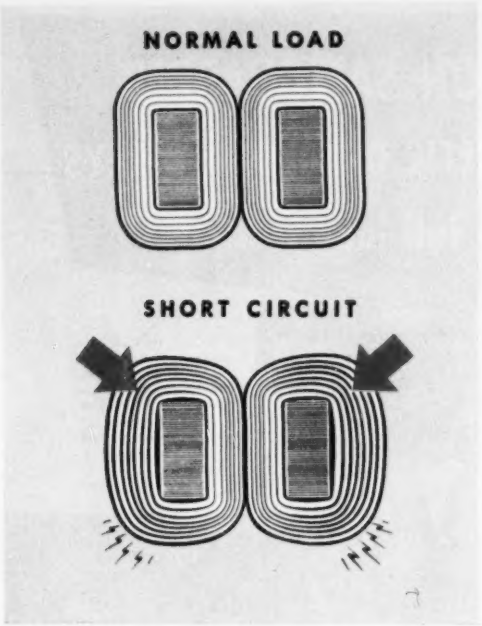


FIGURE 3. Under short circuit currents, rectangular coils tend to distort to a round shape. The forces may be violent enough to damage insulation or even cause complete failure of the coil.

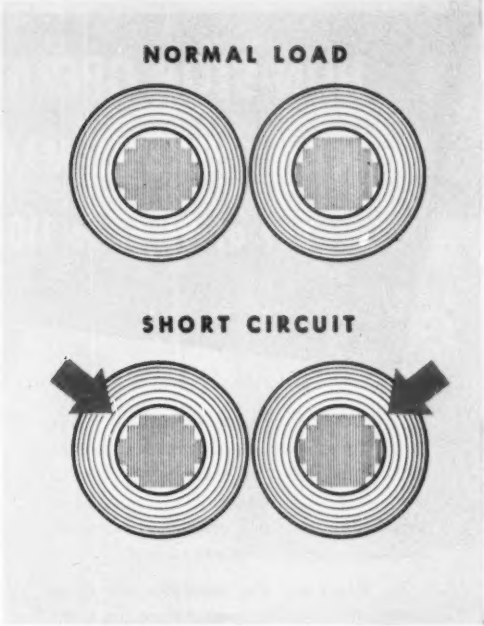


FIGURE 4. Since the coils on Round-Wound transformers are already round, short circuit currents produce very little distortion. Thus "Round-Wounds" have appreciably higher short circuit strength.

The fact that the Round-Wound coils are *round* means that they have not been malleted into a rectangular shape; there are no sharp corners and weak spots caused by damage to the insulation from malleting.

Basic design, plus generous insulation, assures the exceptionally high impulse strength of Round-Wound transformers that is proved not only in laboratory tests but also is borne out by long life performance in actual field service.

Short Circuit Strength

The round coils of the Round-Wound transformer are also a principal factor in the outstanding short circuit strength of this design. As shown in Figure 3, when rectangular coils are short-circuited, the heavy currents tend to force the windings into circular shape. This is very likely to result in damage to the insulation.

But round coils, already circular, are not stressed out of shape, and therefore are not subject to distortion and resulting damage (Figure 4). Thus round coils, plus substantial coil bracing, give Round-Wound transformers inherent advantages in short circuit strength, which contributes materially to their longer life.

Because of their design characteristics, and because of the elimination of variables in production, L-M Round-Wound transformers amply meet NEMA standards with a generous margin of safety.

For Complete Engineering Data

Ask the L-M Field Engineer for the information you want, or write Mr. Kirsch at the Transformer Division, Line Material Company, Zanesville, Ohio (a McGraw Electric Company Division).

Some Outstanding Characteristics of L-M Round-Wound Transformers

High Short Time Overload Capacity

Better Regulation at all power factors

High Impulse Level, with ample creepage distances and generous insulation

High Short Circuit Strength because round coils have less tendency to distort

Low Exciting Current because the core is not cut or disturbed after annealing

Better Loss Ratios with lower total losses

"Round-Wound" is a Line Material trademark.

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LINE MATERIAL

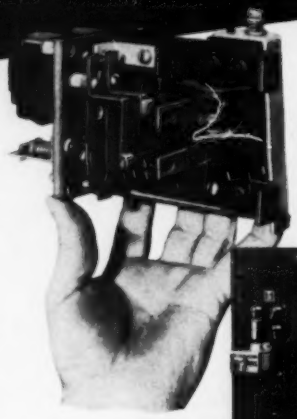
Transformers

Complete Coordinated Equipment for Distribution Today

NON-STOP OPERATION SAFEGUARDED

by EC&M THERMAL-MAGNETIC OVERLOAD RELAYS

set at 90% to 110% full load current



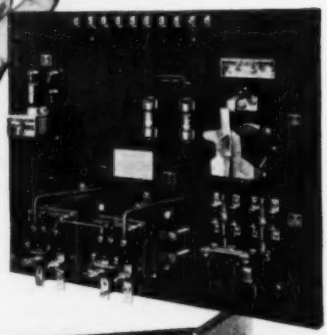
¾ rear view shows independent thermal and magnetic tripping elements — both are adjustable. Relay is front-connected, removable as a unit from the mounting-base.

In a certain chemical processing cycle motor-drives operate up to six months without stopping. Continuous operation is essential until the product is completely processed and the machines cleared. Ambient temperatures are high.

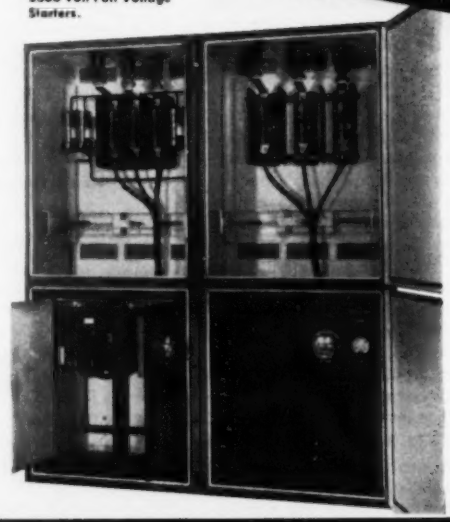
To safeguard the insulation of these motors — by keeping temperature rise within safe limits — EC&M 2300 volt Motor Starters with EC&M NEW Type ZTM THERMAL-MAGNETIC Overload Relays were chosen.

These new Relays couple motor current directly to thermal action through a transformer for quick, positive response. Depending upon the motor load and ambient temperature, the thermal element of these Relays is adjusted from 90 to 110% Full Load Motor Current. Thermal reset time is short. Magnetic instantaneous operation minimizes damage under fault current conditions.

For improved motor protection, investigate EC&M THERMAL-MAGNETIC Overload Relays.



Type ZTM Overload Relay Panel with Time-Delay Under Voltage Protection feature is mounted in the lower compartment of EC&M 2300 volt Full Voltage Starters.



Write for your copy of Bulletin 1180-321.

THE ELECTRIC CONTROLLER & MFG. CO.

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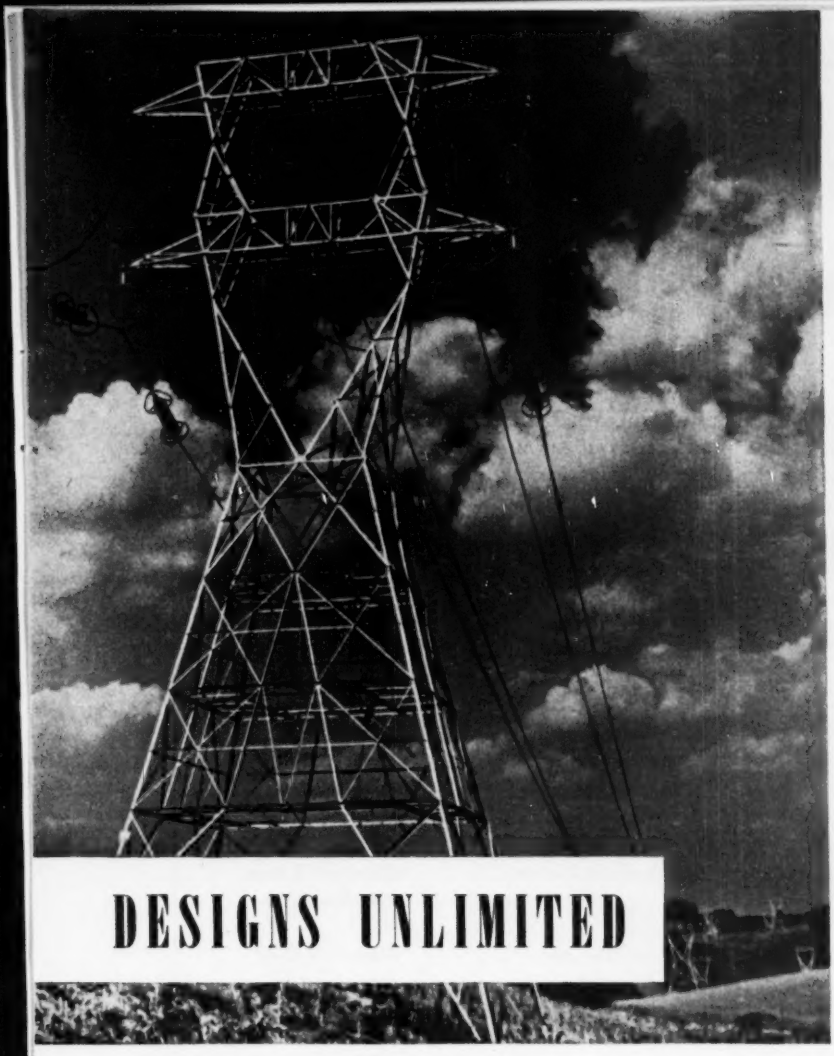

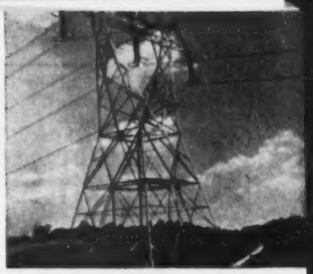

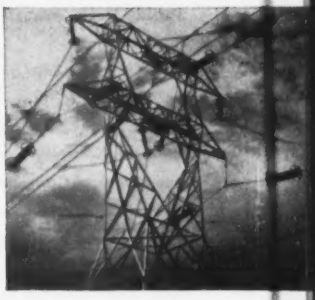

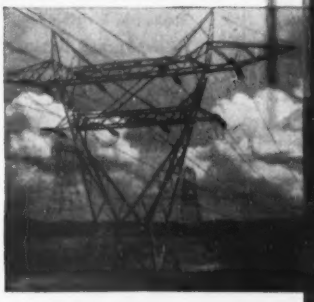

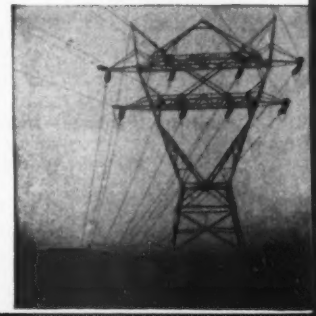

DESIGNS UNLIMITED

If your engineers have their own ideas on tower design, well and good. We will follow them to the letter and adhere closely to specifications. Your engineers realize, as we do, that despite general similarity no two towers are alike. Each tower must be designed for its particular location and purpose.

Let us apply our four decades of experience in building towers for any and all conditions of terrain and load, to your power transmission problems.

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BLAW-KNOX
TRANSMISSION TOWERS

ALUMINUM CONDUCTOR ACCESSORIES AVAILABLE NOW IN AMPLE SUPPLY

To meet the increasing demand because of the rapidly growing acceptance of aluminum conductor, more and more manufacturers now produce aluminum conductor accessories as standard items. Here is a partial list of manufacturers offering a wide choice of conductor accessories:

Anderson Brass Works, Inc.	700 N. 44th Street	Birmingham, Ala.
Bethea Company, Inc.	P. O. Box 1407	Birmingham, Ala.
Bodendieck Tool Company	325 E. Main Street	Taylorville, Illinois
Burndy Engineering		Norwalk, Conn.
A. B. Chance		Centralia, Mo.
Fargo Mfg. Co., Inc.		Poughkeepsie, N.Y.
Hubbard & Company	6301 Butler Street	Pittsburgh, Pa.
Jasper Blackburn Corp.	35 Madison Street	St. Louis, Mo.
James R. Kearney Corp.	4236 Clayton Avenue	St. Louis 10, Mo.
Line Material Company		Milwaukee, Wis.
W. N. Matthews Corp.	3850 Delor Street	St. Louis 16, Mo.
The National Telephone Supply Co.	5100 Superior Avenue	Cleveland 3, Ohio
Ohio Brass Company		Mansfield, Ohio
Penn Union Electric Corp.		Erie, Pa.
Preformed Line Products Co.	5439 St. Clair Ave.	Cleveland, Ohio
Reliable Electric Co.	3145 Carroll Avenue	Chicago 12, Illinois
Thomas and Betts	36 Butler Street	Elizabeth, N. J.

Aluminum conductor accessories may be obtained by contacting these manufacturers direct. For immediate assistance, simply call or write any Kaiser Aluminum office.

Act now!
Give immediate consideration to Kaiser Aluminum conductor on your next job. It will cut your costs up to 25 per cent.

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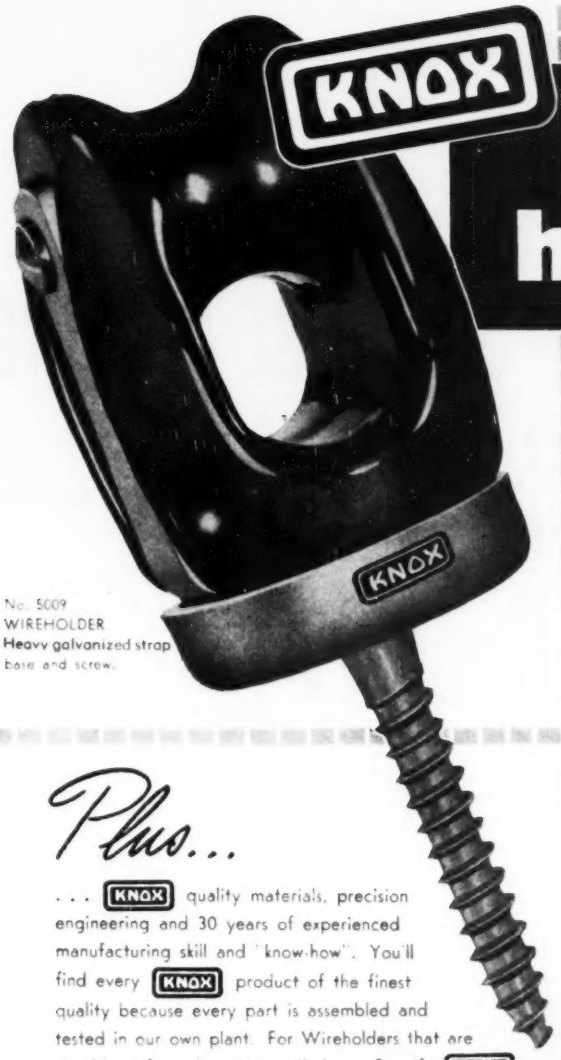
KNOX

wire holders



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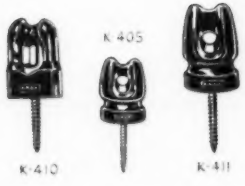

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The New CO Relay

This new CO Relay brings you remarkable, new operating benefits in overcurrent relaying. The reason—the most significant advance in relay design since the introduction of the induction disc relay! We call it simply the "E" element—but look how it contributes to superior relay performance.

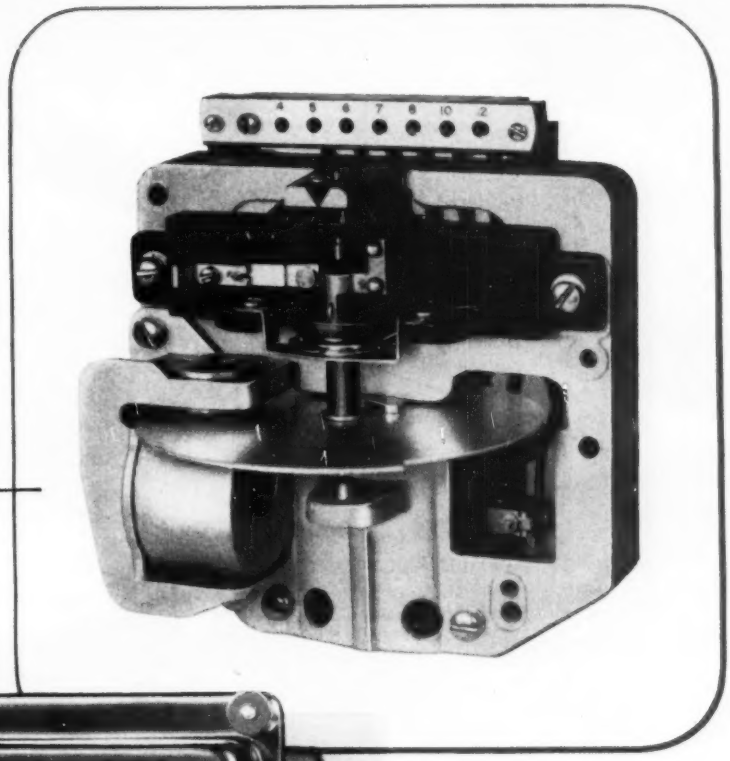
FOR GREATER ACCURACY . . . Magnetic plugs control the saturation characteristics to provide accurate timing over the entire operating range. Two independent adjustments provide accurate pickup at tap value of current for all disc positions. Micrometer adjustment of permanent magnet, by means of a "keeper" screw, which provides accurate adjustment without moving the magnet. Thus, four separate and independent tolerance controls, instead of only two as found on earlier relays, assure you of meeting time curves without compromise.

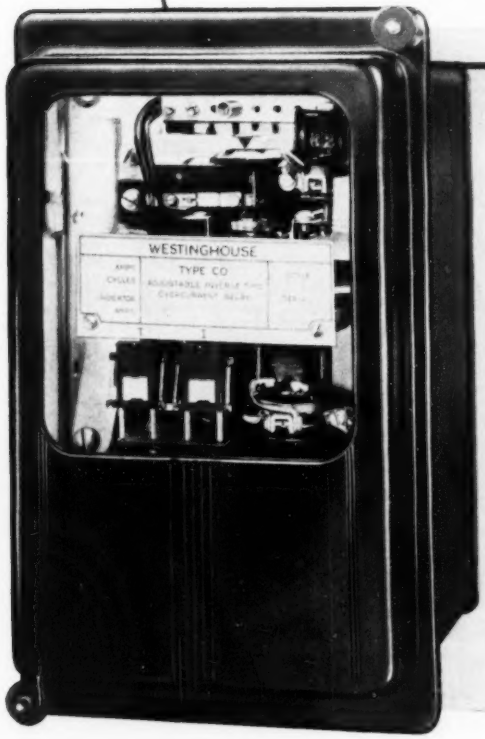
FOR GREATER FLEXIBILITY . . . A "Two-in-one time curve." Inverse and very inverse relays are identical except for calibration and, therefore, may be changed from one curve to the other (or intermediate curve).

FOR GREATER RELIABILITY . . . New positive-action tap block with "self-positioning" taps give metal-to-metal contact between tap terminal and tap plate. Other features contributing to reliable relay protection include: rigid one-piece, die-cast frame—cast alnico magnet—and non-geared design.

Ask your Westinghouse Representative to show you the new CO Relay—he'll be glad to go over it feature by feature with you—or request a demonstration by writing to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-40410





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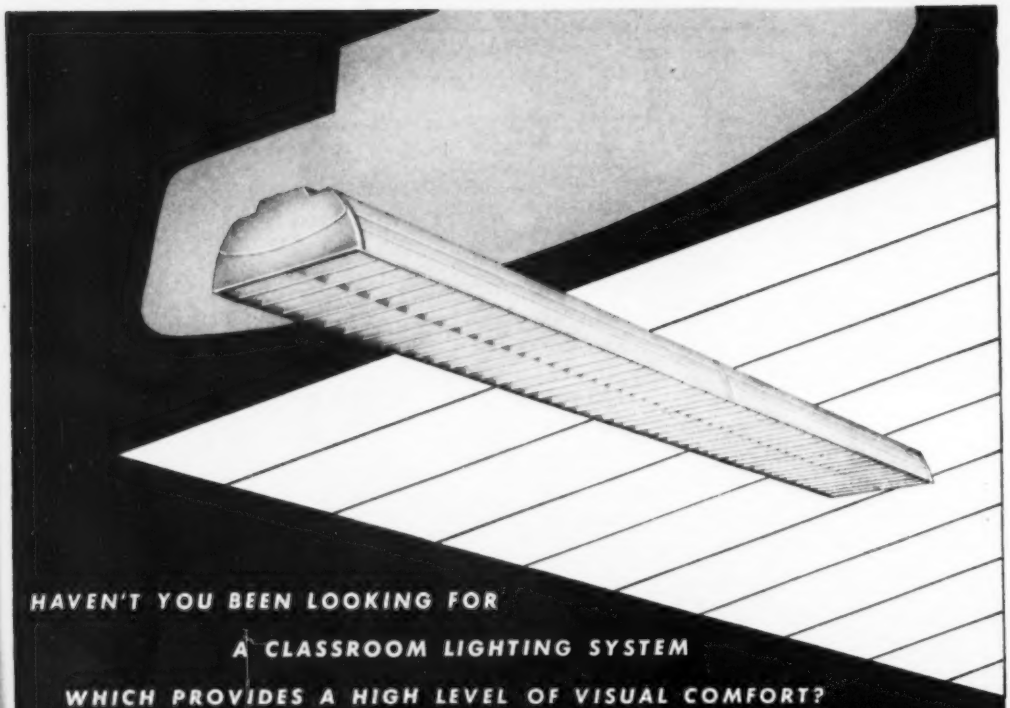
RELAYS

"THE TYPE CO OVERCURRENT RELAY IS AVAILBLE IN FLEX-ITEST OR STANDARD RECTANGULAR PROJECTION CASE."



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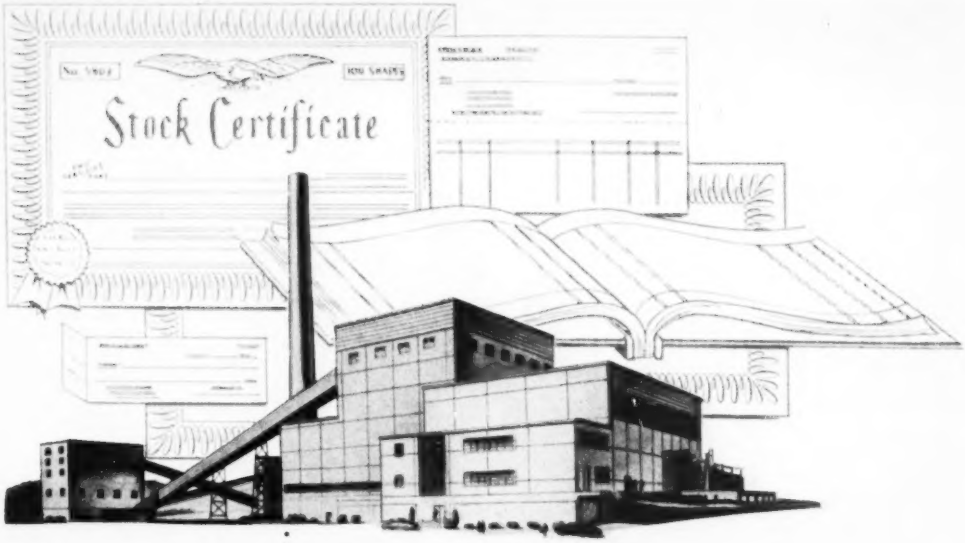

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POWER PLANT DESIGN

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Pioneer has meant power, and the furtherance of the art of power generation and use, since the rise of Industrial America a half century ago.* If you need a new power plant, or an extension or rejuvenation of your present facilities, turn to Pioneer for the best answer.

To acquaint you with the base on which Pioneer design work rests—and perhaps to suggest other Pioneer services which you can use with profit—we have prepared a brief, factual booklet. A request brings it to you.

PSE 50 YEARS

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**Pioneer is successor to the original organization founded in 1902 by Henry M. Byllesby, previously associated with Thomas Edison and George Westinghouse in the design of the world's first steam-operated central station.*

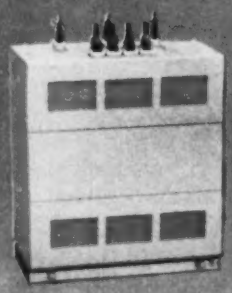
Designed for Economy

Built for Long Life

Tested for Dependability

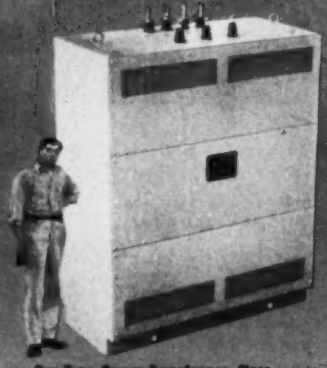
Uptegraff *Dry Type* Transformers

DISTRIBUTION



Dry Type Distribution Transformer. Note large ventilation grilles.

POWER



Dry Type Power Transformer. Sizes available up to 3000 KVA-15 KV.

Uptegraff Dry Type Distribution and Power Transformers are made in standard sizes and ratings up to 3000 KVA-15 KV. Features that mean long life, efficient operation and dependability are: well-ventilated coils for elimination of hot spots; integrated design of core and coil assembly for top level performance with respect to short circuit forces; class B insulation, steel and porcelain structural parts for durability.

Prompt deliveries can be arranged.

Noise-Level Tested

Every Uptegraff Dry Type Transformer must pass a noise level test before shipment.

R. E. Uptegraff Manufacturing Co.

Kennett Square, Pa.

60-cell FME-15 Exide-Manchex in battery room. Mounted on #37343 two-step Exide rack.

(Left) Aerial view of test and control buildings and high-voltage yard of new G-E Switchgear Development Laboratory at Philadelphia.

IN THE NEW G-E SWITCHGEAR DEVELOPMENT LABORATORY

Exide-Manchex BATTERIES

"Largest of its type in the world!" These are among the words used to describe the new high-capacity development laboratory of the General Electric Company. It is capable of delivering 5,250,000 kva asymmetrical, 3,200,000 kva symmetrical, 3 phase, at generator voltage, and of testing power circuit breakers and other switchgear apparatus at voltages up to 440,000 volts.

The battery being used for tripping and closing the breakers in this development work is the Exide Manchex. The battery will also be used for oscillograph operations and to supply indicating lamp loads and power for two 15-hp lube oil emergency pumps for the generators.

With Exide-Manchex Batteries on the job, you can always count on positive switchgear operation . . . instantaneous power . . . extra long battery life . . . low costs of operation, maintenance, depreciation. Exide is your best battery buy . . . *at any* price.

• • •

Various sizes and types of Exide Batteries, up to 100 ampere-hours capacity, are available in plastic containers.

THE ELECTRIC STORAGE BATTERY CO.
Philadelphia 2

Exide Batteries of Canada, Limited, Toronto

"Exide" and "Manchex" *Reg. T.M. U.S. Pat. Off.*

1888 . . . DEPENDABLE BATTERIES FOR 64 YEARS . . . 1952

How Motorola 2-Way Radio *pays for itself* in Savings!

MORE AND MORE ELECTRIC COMPANIES ARE IMPROVING CUSTOMER SERVICE—SAVING MONEY DOING IT!

In any fast moving operation that takes swift, surely accurate timing of all crews and equipment, look to Motorola 2-way Radio as step one in promoting extra efficiency, economy and new operational profit!

As an investment, too, Motorola puts first emphasis on *your profit interests.* This equipment is Motorola-engineered throughout to give you top performance at lowest operating expense. It also gives you the protected value of obsolescence-proof equipment that stays up-to-date for years to come.

Driver of an electric utility company cable truck takes a radio call from his office dispatcher. No wasted time . . . no waiting for instructions!

Substation department dispatcher takes call through this Motorola console, keeping in touch with all the men on the road . . . instantly!

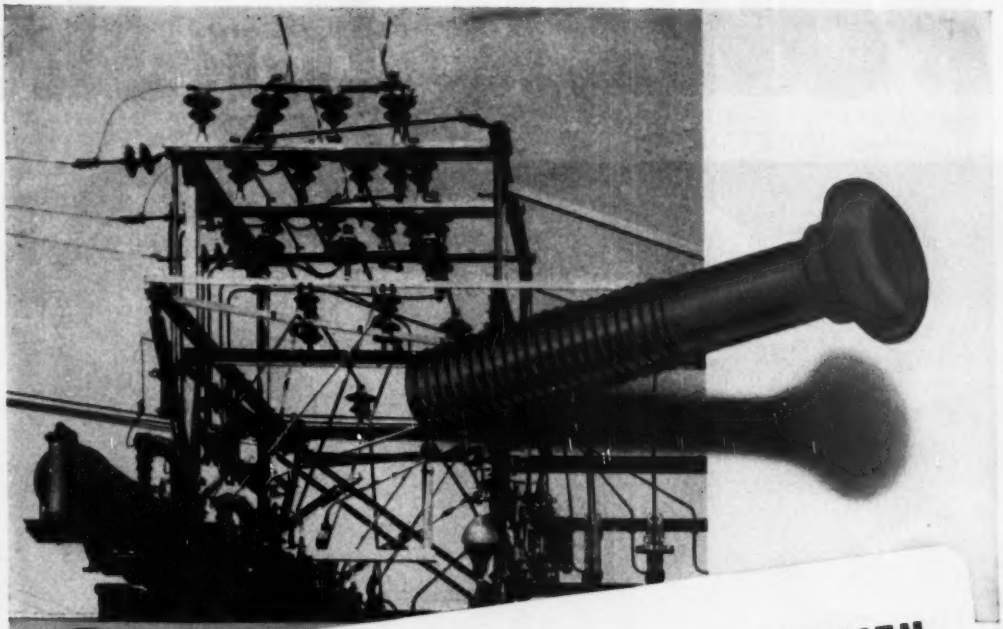
Just one of many Motorola advantages!

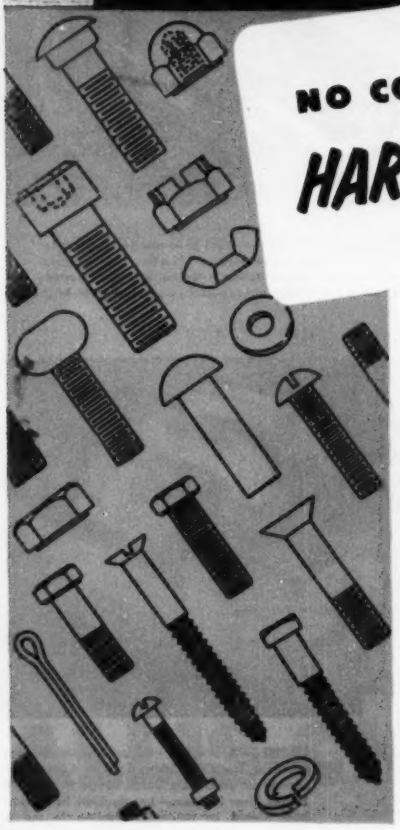
Exclusive Motorola Sensicon Permakay filter keeps your radio sets permanently "on the beam" . . . ends costly tuning adjustments forever!

Motorola

Communications & Electronics Division
4445 Augusta Blvd., Chicago 51, Illinois
Rogers Majestic Electronics Ltd., Toronto, Canada

Photos courtesy of the Detroit Edison Company





NO CORROSION PROBLEM WITH

HARPER CONNECTOR BOLTS

Harper Pan Head Connector Bolts by the thousands are serving on electrical connectors in power transmission equipment. These bolts of silicon bronze are constantly subjected to extreme conditions of corrosion and stress. They typify the quality engineering and metallurgy that are important factors in all Harper fastenings.

Harper Connector Bolts are an example, too, of special fastenings that have been engineered by Harper, standardized, and are now carried in stock for a special industry.

In the Harper line of fastenings carried in stock are more than 7000 items. All types of fastenings of non-ferrous metals and stainless steel are available from Harper. Call the Harper Distributor nearest you or write for information.

The H. M. Harper Company
8205 Lehigh Ave., Morton Grove, Ill.

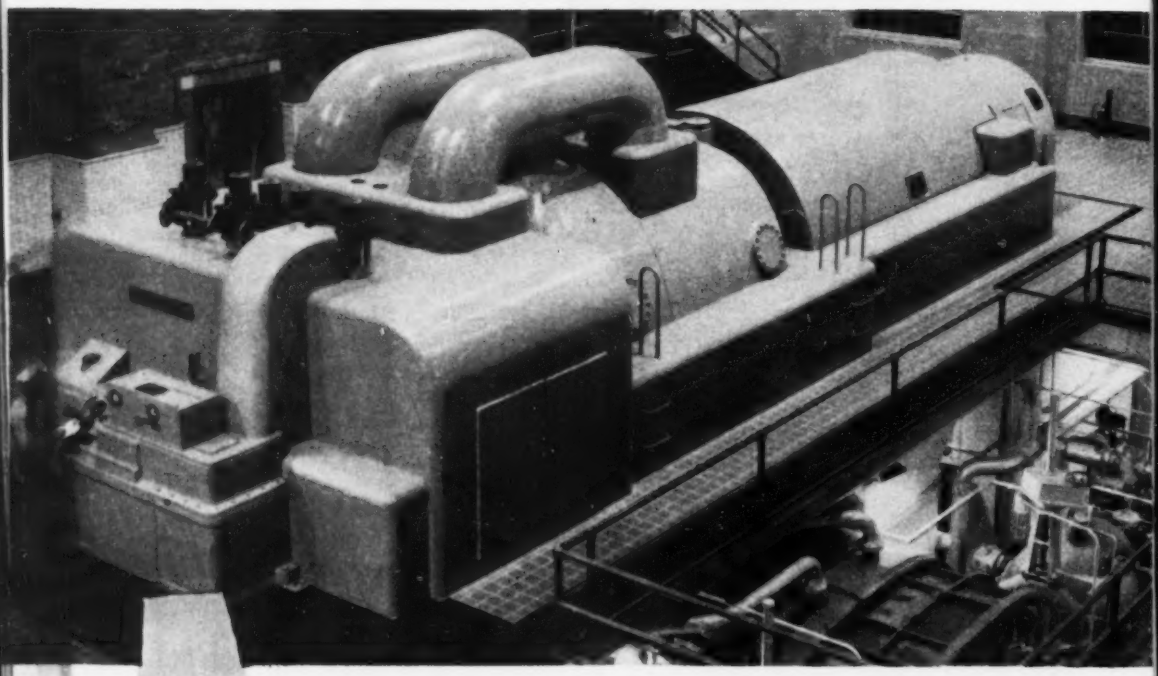
BOLTS • NUTS • SCREWS • RIVETS
STUDS • WASHERS
of
BRASS • NAVAL BRONZE • SILICON
BRONZE • MONEL • NICKEL • ALUMINUM
and ALL STAINLESS STEELS

HARPER

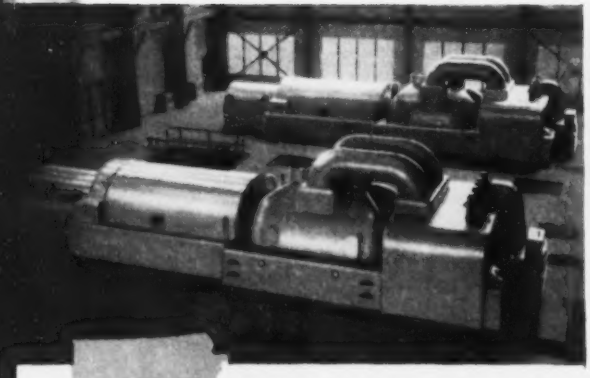
EVERLASTING FASTENINGS

Specialists in all non-corrosive metals

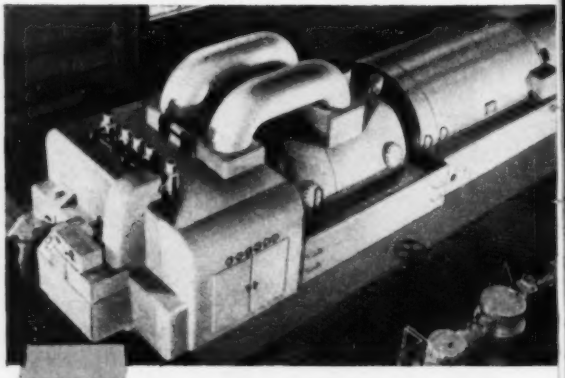
POWER for the



ALABAMA area has experienced an industrial power consumption rise of over 12½% in one year's time. To help meet this rocketing power demand, the Alabama Power Company just recently installed this Allis-Chalmers 40,000 kw steam turbine hydrogen cooled generating unit at its Chickasaw station in Mobile. A-C also supplied the 30,000 sq ft surface condenser and its auxiliaries, including two 25,000 gpm circulating pumps and motors.



ARKANSAS has the largest U. S. deposit of bauxite ore, primary to the production of aluminum. These two Allis-Chalmers 40,000 kw condensing, tandem compound steam turbine hydrogen cooled generating units form the Lake Catherine steam-electric station of the Arkansas Power & Light Company. Most of this power is used to electrolytically reduce alumina.



LOUISIANA industry and agriculture are mushrooming. The Gulf States Utilities Company — serving an area from Baton Rouge to across the Brazos River in Texas—has doubled its customers and tripled its power generation in the last decade. A-C recently supplied 75,000 kw in generating capacity to Riverside station near port city of Lake Charles. Unit shown is 40,000 kw.

Booming South!

NEW ALLIS-CHALMERS TURBINE-GENERATORS HELP SUPPLY MUSHROOMING INDUSTRIAL DEMAND

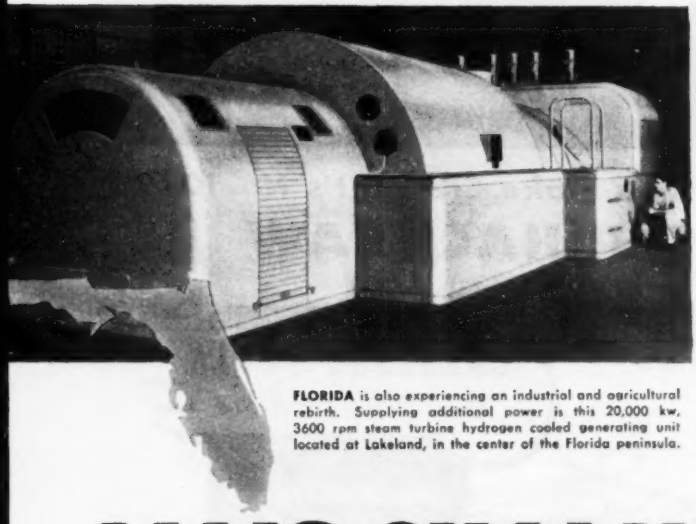
YOU'VE HEARD OF the South's mushrooming industrial growth. Here are some of the Allis-Chalmers steam turbine generator units newly installed to help satisfy that insistent power demand.

All these modern units conform to AIEE-ASME preferred standards in addition to incorporating many exclusive Allis-Chalmers main design features. The hydrogen cooled generators all have the A-C originated "walk-in" exciter housings. And these 3600 rpm turbines all have the following outstanding features:

Hydraulic control and operation with accessible placement of main stop valve; centralized grouping of operating controls; cam-operated inlet valves accessibly located on top of cylinder; and exclusive A-C method of temperature compensation for horizontal *and* vertical thermal movement.

All oil piping is above the floor, simplifying foundation and installation. And, as throughout the complete Allis-Chalmers line—ranging from the smallest single cylinder machines to single shaft, tandem compound, condensing units of 150,000 kw — labyrinth steam seals are used. The steam sealed gland system is self-contained and provides dependability with minimum attention.

You get the real design advances *first* from Allis-Chalmers. When planning the installation or expansion of your steam-electric power plant, let A-C simplify your problem. This *one* source will provide you with the world's widest range of power plant equipment. For your copies of literature on all products mentioned, call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wisconsin. A-3842



FLORIDA is also experiencing an industrial and agricultural rebirth. Supplying additional power is this 20,000 kw, 3600 rpm steam turbine hydrogen cooled generating unit located at Lakeland, in the center of the Florida peninsula.

ALLIS-CHALMERS *firsts*

Simplified hydrogen seal and control

World's lowest exhaust pressure steam turbines

Solidly-bolted-down steam end pedestal

Turbine for one-boiler-per-turbine arrangement

"Walk-in" exciter housing

30,000 kw, 825 F turbine, in 1931

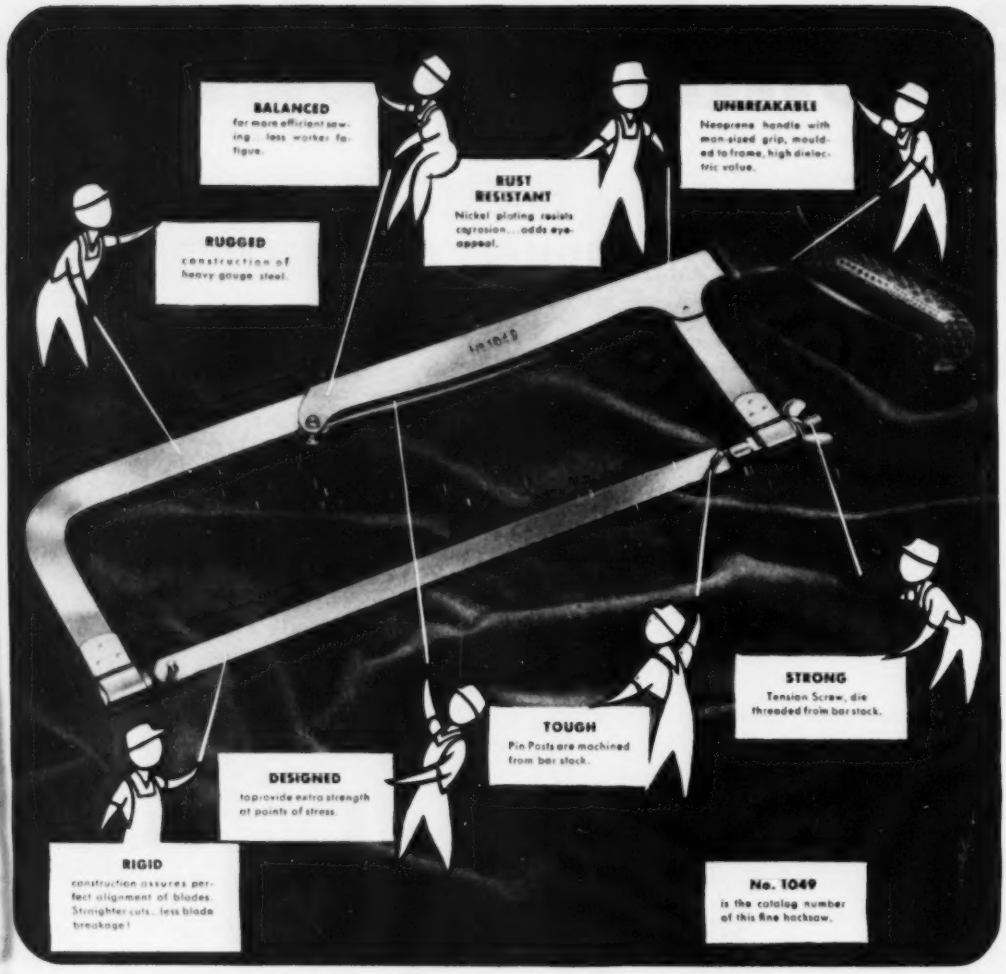
825 F reheat turbine, in 1935

AND NOW...First with supercharged hydrogen cooling!

ALLIS-CHALMERS

World's Widest Range of Power Plant Equipment

TURBINES & GENERATORS | CONDENSERS & PUMPS | SWITCHGEAR & BREAKERS | MOTORS & CONTROL | TRANSFORMERS | WATER CONDITIONING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for more efficient sawing... less worker fatigue.
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Nickel plating resists corrosion... adds eye-appeal.
UNBREAKABLE
Neoprene handle with man-sized grip, moulded to frame, high dielectric value.
RUGGED
construction of heavy gauge steel.
STRONG
Tension Screw, die threaded from bar stock.
TOUGH
Pin Posts are machined from bar stock.
DESIGNED
to provide extra strength at points of stress.
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construction assures perfect alignment of blades. Straighter cuts... less blade breakage!
No. 1049
is the catalog number of this fine hacksaw.

These eight features make Crescent's No. 1049

A BETTER HACKSAW

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CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

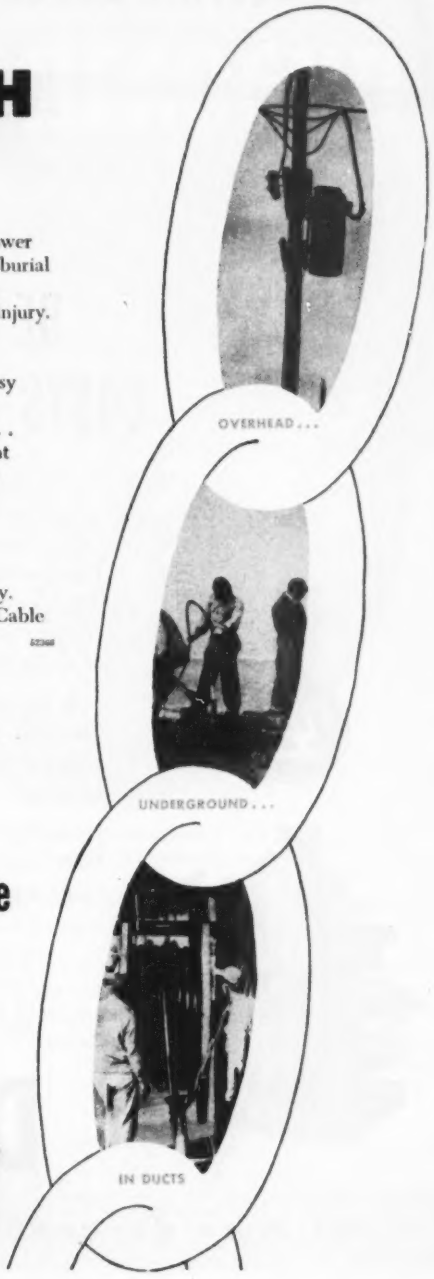
NO WEAK POWER LINKS

with DURASHEATH

ALL-PURPOSE DURASHEATH* can be used for every type of power and lighting application. In combined duct, aerial and direct-burial use, Durasheath effectively resists electrolysis, condensation, weathering, sunlight, organic decay, abrasion, and mechanical injury.

DURASHEATH COSTS LESS to install . . . because it is flexible, easy to handle, light in weight. It may be run in one continuous length *without expensive splicing*. It costs less to maintain . . . because its tough neoprene jacket can take terrific punishment in any use. It costs less to stock . . . because, instead of three cables, one – versatile Durasheath – meets every electrical distribution requirement.

SPECIFY DURASHEATH for economy, reliability, and durability. Consult your Anaconda Representative. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.



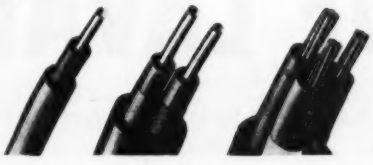
the right cable for the job

ANACONDA® wire and cable

for traffic control, airport† power and lighting, mines, industrial plants, railroads, street lighting, and many other uses.

available in all sizes—from large to small—single and multi-conductor.

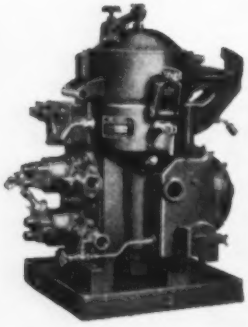
*Trademark
†when ordered to CAA Specification L-824.



DE LAVAL CENTRIFUGING COSTS LESS THAN "DOWN TIME"

The cost of a De Laval Centrifugal Oil Purifier of any given size is only a fraction of the cost of the prime mover it protects. There's no denying it, the comparatively modest investment represented by a De Laval Oil Purifier is far outweighed by the cost of even one serious shutdown. A De Laval machine is truly inexpensive insurance.

A De Laval Purifier instantaneously removes from lube oil, all water, dirt or sludge by means of centrifugal force, keeping the oil clean and safe to use over and over again.



De Laval Oil Purifiers protect power units from ***both*** causes of lubrication failure—they never do a "half-way" job.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

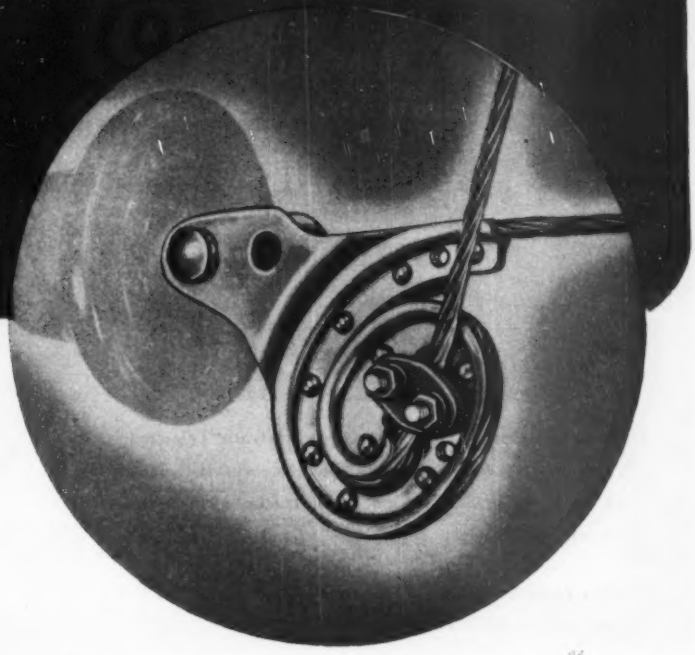
DE LAVAL

for more dependable power production

Reliable SNUB DEADEND

Easy on CONDUCTORS

Easy to INSTALL



The Reliable No. 420 Snub Deadend is made of high strength, non-corrosive aluminum alloy, is low in cost and accommodates No. 2 or No. 4 A.C.S.R. It has been approved for use on A.C.S.R. without armor tape.

The spiral form of this deadend for A.C.S.R. carries the snub principle to full advantage. This clamp develops approximately the full strength of the conductor and distributes the strain equally on all strands.

It is easy to install. A hole has been provided for attaching a sling which holds the deadend in proper position while the conductor is being attached. The 2-bolt bridge clamps and holds the A.C.S.R., both the aluminum and the steel, after more than a full one and one-half turns of snub. The No. 420 develops the full strength of the wire. Weighing about three-quarters of a pound, this clamp minimizes vibration fatigue strains, prolonging the life of the conductor.

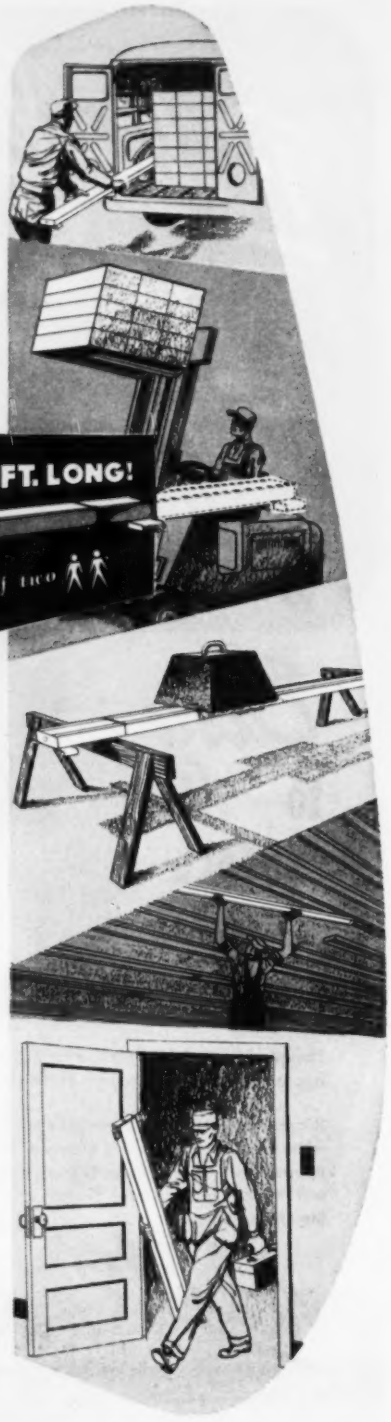
Reliable ELECTRIC COMPANY

3145 CARROLL AVENUE
CHICAGO 12, ILLINOIS

OVER 45 YEARS OF SERVICE TO THE UTILITIES

POWER-LINE CONNECTORS and CONSTRUCTION SPECIALTIES

CUT HANDLING COSTS SAVE STORAGE SPACE WITH GUTH TELESCOPING CHANNELS*



Easier to handle—One man can carry a Guth "Telescopic" Channel anywhere—even in an elevator. Compactness makes them easier to load safely on skids, trucks, etc.—reduces transportation damage.

Easier to store—Guth "Telescopic" Channels require 45% less space in warehouse and on-the-job storage.

Extra strong—Overlaps at joining points result in extra strength and rigidity.

Fully wired . . .

Special joiners assure perfect alignment of several channels in a line. Three overall lengths: 10, 8 and 6 ft.

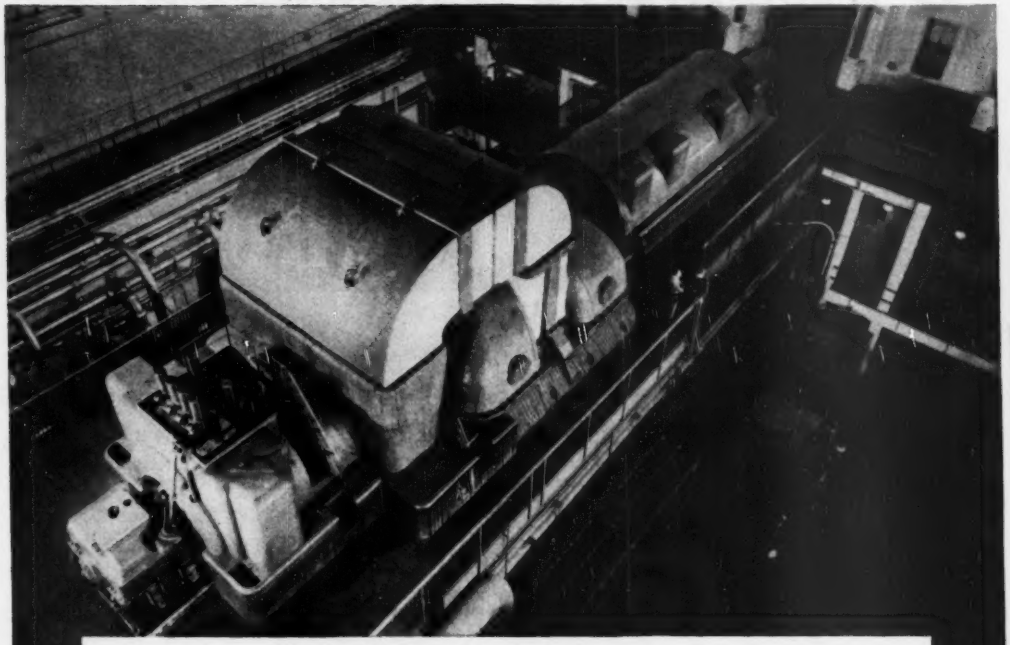
See your GUTH resident engineer or write for CATALOG 48-H today.

*U. S. Pat. No. 2532023

THE EDWIN F. GUTH CO.

ST. LOUIS 3, MISSOURI

Typical of the outstanding steam turbines lubricated with Gulfcrest Oil: 182,000 kw General Electric turbine—the world's largest single-shaft unit—at the Richmond Plant of the Philadelphia Electric Company.



Just RIGHT for every steam turbine.
—GULFCREST OIL

the RIGHT base stock, Alchlor-processed

the RIGHT combination and concentration of additives

the RIGHT background of performance

Gulfcrest Oil has a background of successful performance in every type and make of steam turbo-generator.

In many of these installations the original charge of Gulfcrest has been in service more than 10 years with no significant change in its original characteristics, and with neutralization numbers always remarkably low and safe.

To get this kind of lubrication for your turbine, call in a Gulf Sales Engineer and ask him to recommend the proper grade of this superior oil for your turbine. Write, wire, or phone your nearest Gulf office today.

Gulf Oil Corporation · Gulf Refining Company

Pittsburgh 30, Pennsylvania

GULF INDUSTRIAL LUBRICATION

Another hazardous

by installing CROUSE-HINDS *Explosion-Proof* CONDULETS*

The photographs below show an electrical control center for power and lighting circuits in a chemical plant.

This is an area in which non-explosion-proof equipment was reasonably safe at the time of the original installation. At a later date, changing conditions with the use of flammable solvents created a definitely hazardous location. With electrical devices and wiring housed in non-explosion-proof enclosures, the safety of the entire plant was threatened.

This perilous situation was promptly corrected by an installation of Crouse-Hinds Explosion-Proof CONDULETS as shown in the photograph at the right. In addition to protection against explosion, the CONDULETS reduced maintenance by providing protection against corrosion.

ARE THERE SIMILAR CONDITIONS IN YOUR PLANT?

A careful survey of your plant might reveal that there are unprotected areas where there is a possibility of the presence of explosive atmospheres in dangerous concentrations. Such conditions are a constant source of danger . . . possibly disaster!

Remove the danger by putting in an installation of Crouse-Hinds Explosion-Proof CONDULETS . . . the complete line that gives you thousands of items from which to select the ones that exactly fill your needs.

Explosion-Proof CONDULETS

1. Type EDP Lighting Panelboard
2. GUA Series Junction Condulets with Dome Covers
3. Type EFS Pushbutton Stations
4. Type EPC Combination Line Starters
5. Type FLB Circuit Breakers
6. Type FLF Manual Starters
7. Type EYS Sealing Condulets

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

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RESIDENT REPRESENTATIVES: Albany — Atlanta — Baltimore — Charlotte — Corpus Christi — Richmond, Va.
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

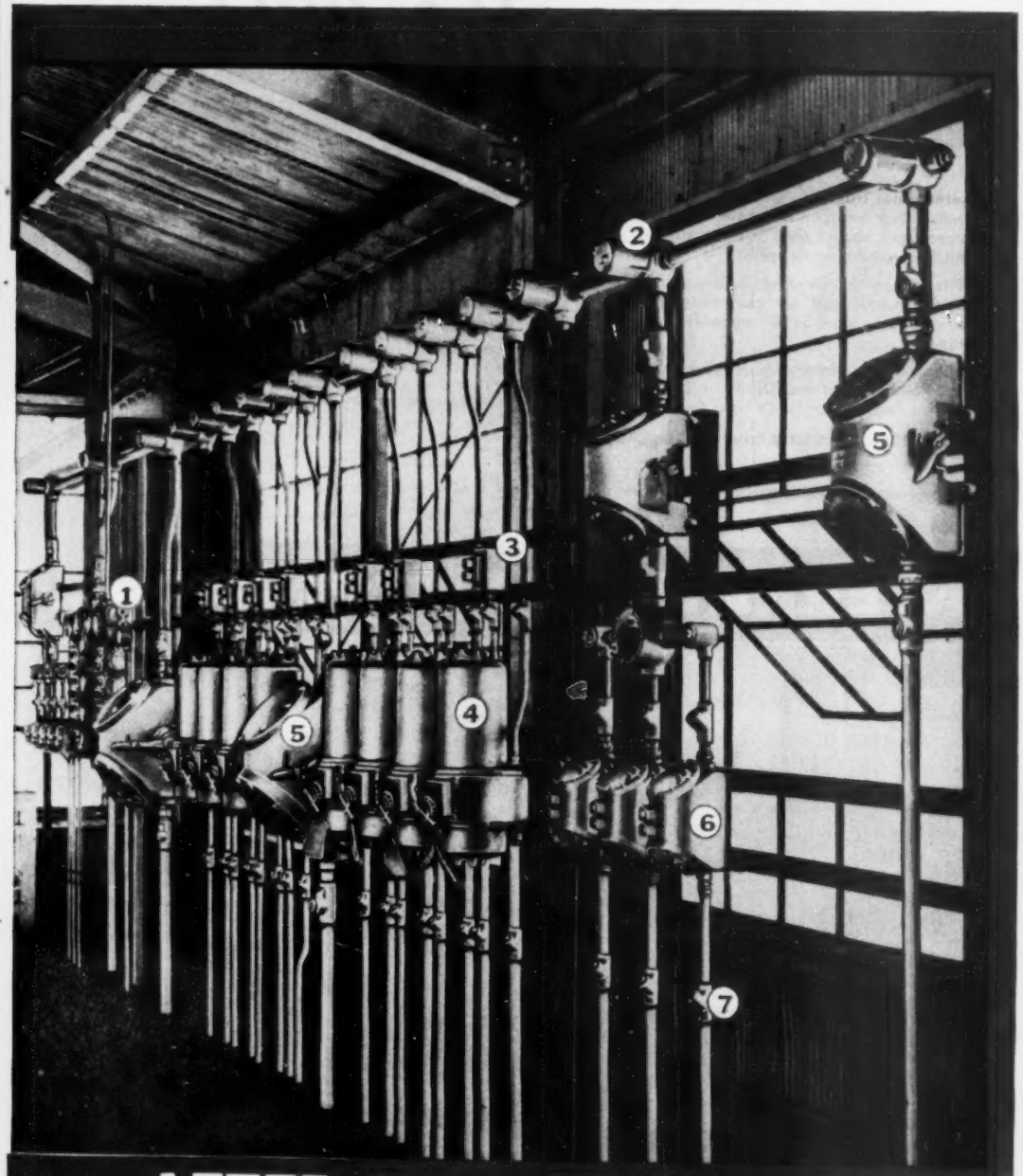
*CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

A Nationwide Distribution Through Electrical Wholesalers

BEFORE

• CONDULETS • AIRPORT LIGHTING

area made SAFE



AFTER CONDULETS were installed

TRAFFIC SIGNALS • FLOODLIGHTS •

Right on the job!

International Trucks are strictly *right* on the job because they incorporate all the advantages a service truck should have. They're rugged, dependable, economical to operate.

The all-steel service-utility bodies are welded into one rugged unit. Compartments and bins are of various sizes to accommodate all your equipment.

There are many International Trucks to choose from. Your International Dealer or Branch can help you find the one that's right for your job.

INTERNATIONAL HARVESTER COMPANY · CHICAGO

Only International gives you all this:

- Silver Diamond valve-in-head truck engines are rugged, packed with extra power. Engineered to save you plenty on operating and maintenance costs.
- New green-tinted, non-glare safety glass available in the Comfo-Vision Cab. One-piece full-vision windshield.
- Super-steering—more positive control. Wider front axles make possible full 37° turning angle for easier handling and maneuverability.
- Wide variety of light-duty models — ½, ¾, and 1-ton sizes — GVW's from 4,200 to 8,600 lbs. 115, 127, 134-in. wheelbases. Pickup, panel, stake, and many other types of bodies.

International Harvester Builds McCormick Farm Equipment and Farmall Tractors . . . Motor Trucks . . . Industrial Power . . . Refrigerators and Freezers

Better roads mean a better America

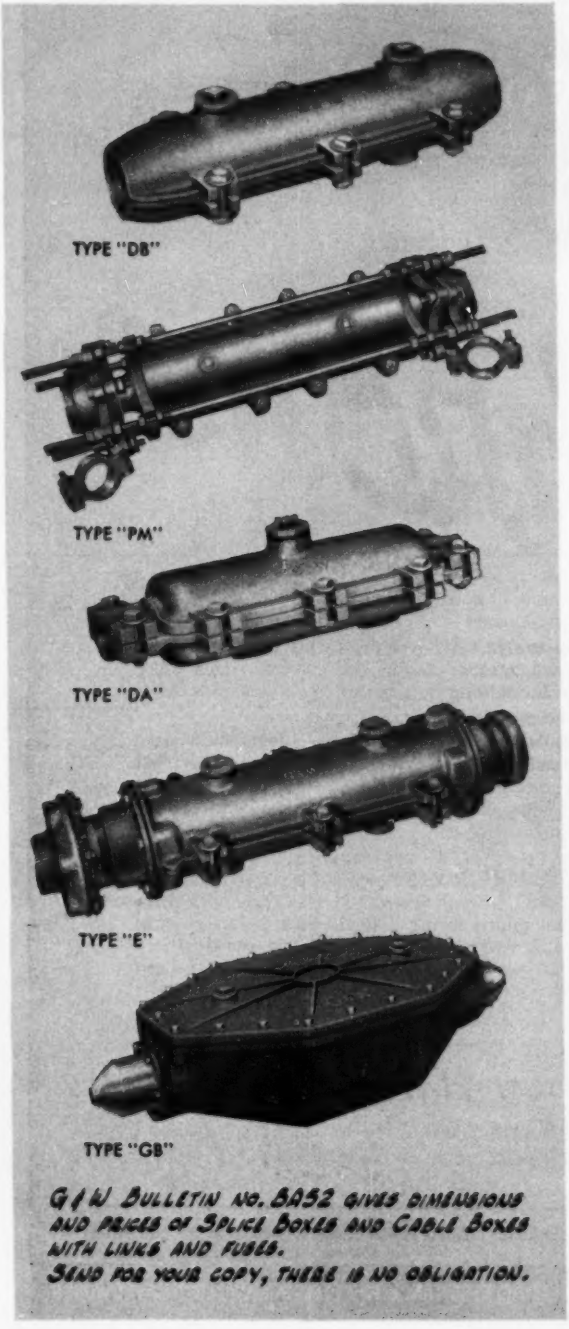
INTERNATIONAL TRUCKS

"Standard of the Highway"

International L-130 series with special service-utility bodies—115 and 134-inch wheelbases. GVW's from 6,800 to 8,600 lbs.

USE THE *right* G&W SPLICE BOX

for proper protection to your cable joint.



G & W BULLETIN NO. BA52 GIVES DIMENSIONS AND PRICES OF SPLICE BOXES AND CABLE BOXES WITH LINKS AND FUSES.
SEND FOR YOUR COPY, THERE IS NO OBLIGATION.

SPLICE BOXES

TYPE "DB" for buried cable joints with and without lead sleeves. (New design.)

TYPE "PM" for submarine cable joints—including strain rods and wire armor clamps.

TYPE "DA" for armored telephone cable joints buried in the ground.

TYPE "E" with interchangeable fittings for steel tape or wire armored cables or for conduit; with wiping sleeve or stuffing box cable seals.

TYPE "GB" for up to 15000 volt buried cable joints. Connecting lugs (for copper or aluminum cable) are mounted on porcelain supports which establish proper electrical characteristics.

Splice boxes illustrated are cast iron for maximum corrosion resistance. All are to be solidly filled with compound.

G & W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Ill.
Cable Terminating, Connecting and Sectionalizing Devices
Representatives in principal cities of U. S. A.
In Canada—Powerlite Devices, Ltd., Toronto and Montreal

ONE Nichrome

"One World." All over the globe, men have come to acknowledge this unique concept as the most effective basis for solving innumerable problems related to human progress.

"One Nichrome." All over the globe, men have come to acknowledge this unique alloy as the most effective means for solving a host of problems also related to human progress—in the fields of engineering and production.

This being so, we take particular pride in our trademark: NICHROME—granted solely and wholly to us by the United States Patent Office forty-three years ago. Representing a series of superb electrical heating and resistance alloys, developed and produced *only* by Driver-Harris, it symbolizes top quality and utmost dependability to manufacturers everywhere.

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World-Famous **Nichrome**® is produced only by

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Manufactured and sold in Canada by The B. GREENING WIRE COMPANY, LTD., Hamilton, Ontario, Canada

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MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD

THIRTY FEET HIGH in THIRTY SECONDS

Simple, Easy, One-Man Operation

1. Ladder hold-down on cab roof is released.

2. Pressure is applied to lower ladder rung.

3. Ladder is locked in elevated position.

4. Upper section is extended to desired height.

5. Ladder is rotated to spotting position.

6. Incline of ladder is adjusted as required.

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REVOLVING AERIAL LADDER

Sounds unbelievable . . . but the *Powers-American* Aerial Ladder is so simple, so fast, and so easy to operate that it can be raised to a working position in only 30 seconds—by *one man!* This versatile ladder can be spotted in 40 positions throughout a 360° revolution . . . inclined to any angle from 30 to 75 degrees. Its curved platform falls into position automatically—to provide a level working surface. What's more, this ladder is so safe that it will support *five* times the normal working load. If your operation calls for overhead work, get all the facts on *Powers-American* Aerial Ladders. Mail the coupon NOW for complete information.

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☐ Line Construction Bodies	☐ Wire Reels	☐ _____
☐ General Service Bodies	☐ Pole Trailers	☐ _____
☐ Light Duty Maintenance Bodies	☐ Hydraulic Towers	☐ _____

Name _____

Company _____

Address _____

City _____ Zone _____ State _____

Facts from
NEW YORK

"'CSP' Transformers save us $16,000 a year"

"92% fewer outages . . . savings of approximately $16,000 a year . . . that's the record of 'CSP' Transformers compared with conventional types of transformers on our lines," says a leading utility in New York State.

"Records recently completed, covering a period of years, show that burn-outs from lightning took 0.784% of the installed capacity of conventional transformers, compared with 0.062% for the 'CSP' Transformers on our system."

Installation and maintenance costs for Westinghouse "CSP" (Completely Self-Protecting) Transformers are always lower, because complete protective equipment is built in, not separately mounted. A two-year survey of Electric Light and Power Companies shows the following:

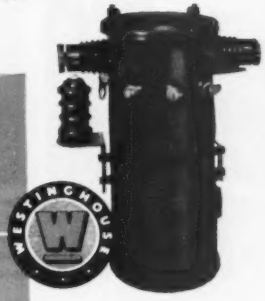
NATIONAL AVERAGES

	"CSP"	Conventional
Installation Costs	$13.87	$24.74
Burn-out Rate	0.257%	1.005%
Fuse Outages	None	5.64% @ $6.52 per outage
Load Checks	Automatic	12.8%
Breaker Reset	1.02%	None

If you'd like to check your own costs against these national averages, ask your Westinghouse representative for Booklet 4247-E, "Transformer Costs and Their Relation to Profits". Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

"CSP" devices . . . originated and patented by Westinghouse

YOU CAN BE SURE... IF IT'S
Westinghouse
"CSP" DISTRIBUTION TRANSFORMERS



J-70592

G-E CIVIL DEFENSE FILM AWARDED FREEDOMS FOUNDATION PUBLIC SERVICE MEDAL

Outstanding public service release currently available for civic and industrial showings

MORE than 10 million people have seen General Electric's civil defense film showing how a city prepares its communications network for vital disaster service. A dramatic documentary, the 22-minute motion picture stresses the role of communications in everyday life, depicts an atomic blast over Syracuse, N. Y. and demonstrates how the existing communication systems of a city and a county can be coordinated in an emergency. The film is a part of the nation-wide Communications Advisory Service, a G-E organization of electronics engineers whose consultation services are available to communities and industries of every size.

One of the most popular films in G-E history, "Voice" is being sponsored by civic and industrial groups across the nation to stimulate public interest in civil defense. If you want it for your community at only nominal cost for mailing, call the CAS* man at the G-E office near you, or write us. *General Electric Company, Section 19102-20, Electronics Park, Syracuse, New York.*

*Communications Advisory Service

Freedoms Foundation president Kenneth D. Wells, presents award scroll to Roy D. Jordan (center), secretary of G.E.'s Electronics Division CD Committee, and Neal F. Harmon, G.E.'s CD Coordinator.

The film shows evacuation of residents from the city by taxicab after the atom "blast" plus many other eye-opening scenes. Will your city be prepared? Be sure to see this timely civil defense film.

Lt. General Willis Crittenberger, commanding First Army, with G.E. Vice-President W. R. G. Baker on nationwide TV showing of film. More than 30 TV stations have screened the picture as a public service.

GENERAL ELECTRIC

MONSANTO PENTA protects wood in the towers of Love Field's new approach light lane.

Monsanto Penta plays part in happy landings

A new, high-intensity approach light lane, to guide planes to happy landings, is in service at Love Field, Dallas, Texas. Supporting poles, H-frames and platforms are protected by Monsanto Penta to give them longer life.

In the 2,420-foot approach lane are 21 towers, 35 to 65 feet high, each constructed of two poles topped with a platform supported by H-frames. Some of the poles are set in Bachman Lake and will stand in water constantly. Poles, platforms and frames are southern yellow pine. All are protected by Monsanto Penta, applied by pressure to a minimum net retention of 8 # penta-in-oil solution per cubic foot of wood. The preservative was applied for the Civil Aeronautics Administration by Standard Wood Preservers of Shreveport, Inc., Shreveport, Louisiana.

Monsanto Penta (pentachlorophenol) is a stable chemical made for wood preservation. It protects against decay . . . against termites and other wood-boring insects. It does not leach. Rain and ground water cannot wash it away. Penta treatments can be designed to make wood moisture-repellent and to leave surfaces clean and paintable.

FOR INFORMATION *on the use of Monsanto Penta, contact the nearest Monsanto Sales Office. Write for a copy of Monsanto's new booklet,* "For Maximum Wood Protection, Specify Monsanto Penta." MONSANTO CHEMICAL COMPANY, *Organic Chemicals Division, 800 North Twelfth Blvd., St. Louis 1, Missouri.*

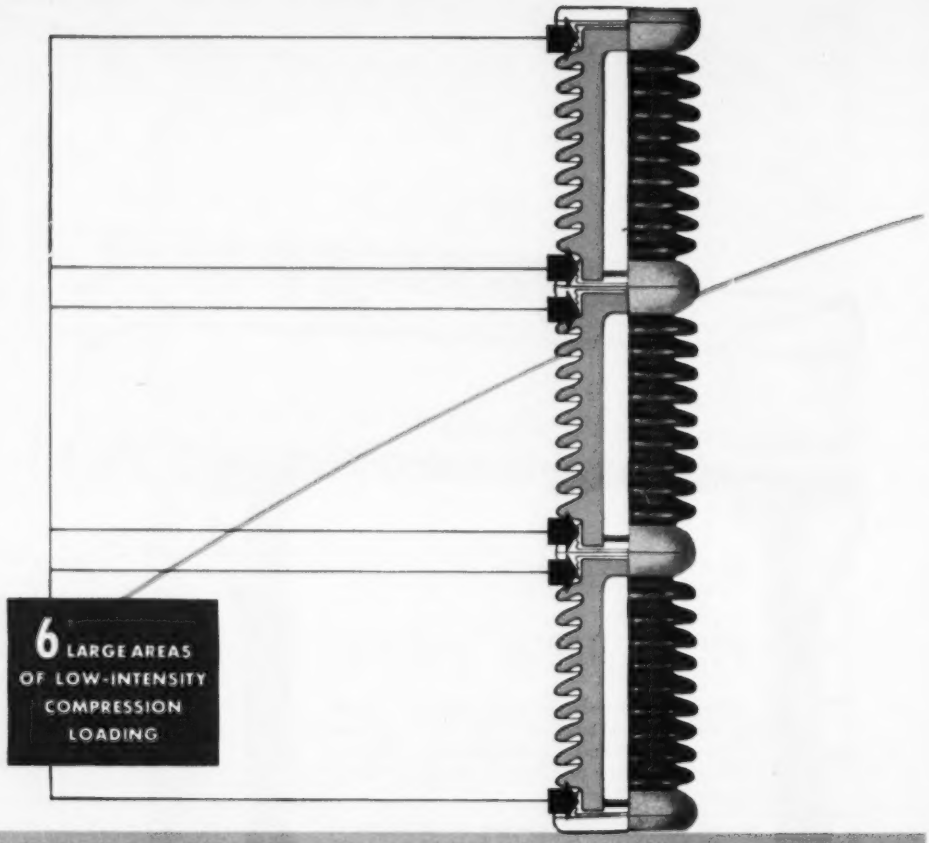
District Sales Offices:

Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle, Twin Cities. In Canada, Monsanto Canada Limited, Montreal.

PENTA

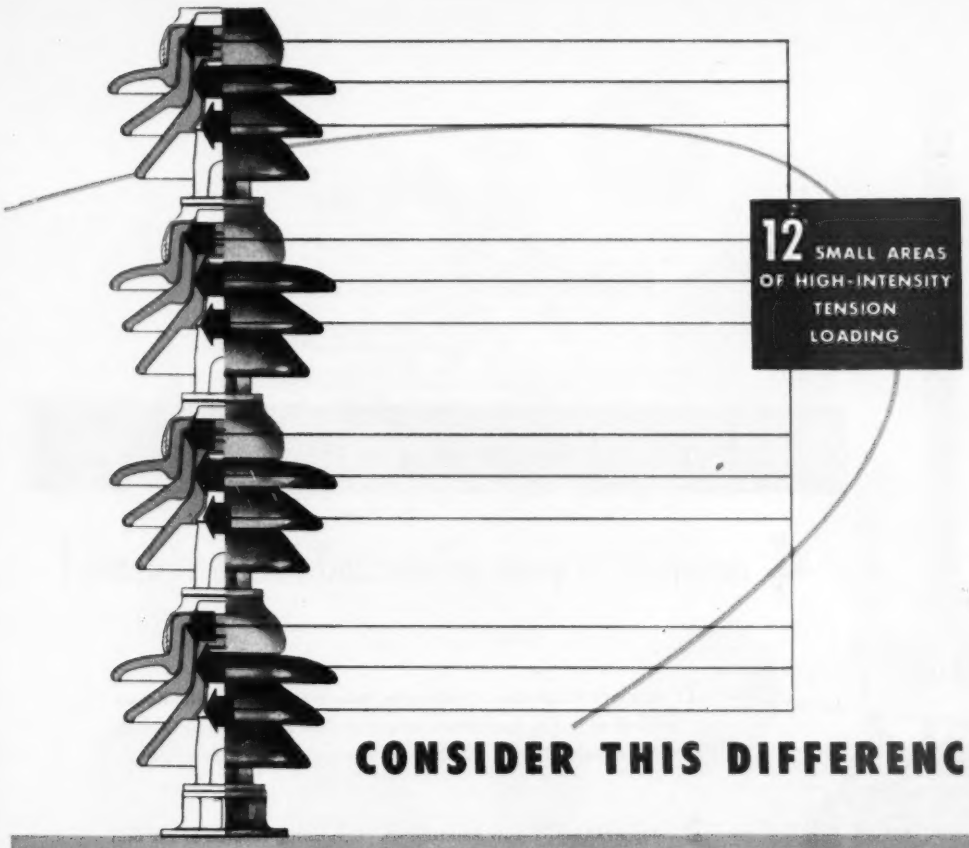
MONSANTO
CHEMICALS — PLASTICS

Serving Industry . . . Which Serves Mankind



Lapp

LAPP INSULATOR COMPANY, INC., LE ROY, NEW YORK



CONSIDER THIS DIFFERENCE...

. . . BEFORE YOU ACCEPT ANY SPECIFICATION FOR ANY SWITCH OR BUS SUPPORT INSULATOR

There are important differences between the Lapp Station Post and a conventional multi-part pin-and-cap station insulator—a difference in appearance—a bigger difference in how they work. For switch and bus support, mechanical security is fully as important as electrical characteristics. Rigidity and permanence under stresses from thermal change, tension, cantilever and impact, depend on security of mechanical loading within the insulator. In the Station Post design, Lapp recognizes that porcelain is approximately 10 times as strong in compression as in tension. This advantage is utilized in building the Station Post with hardware externally attached. In the corresponding units sketched above—a Lapp Station Post and a NEMA Standard pin-cap assembly—for duty at 138-161 kv, *compare* the *six* cemented joints of the Lapp Station Post, which can load porcelain only in compression, with the *twelve* nested shells of the pin-cap unit, each an area of loading which depends on tension strength of the porcelain. Isn't the Station Post superiority evident as a simple engineering conception? It's just as evident in operating security . . . in length of life . . . in elimination of outages . . . in cost of maintenance.

4 answers to your pulverized fuel problems!

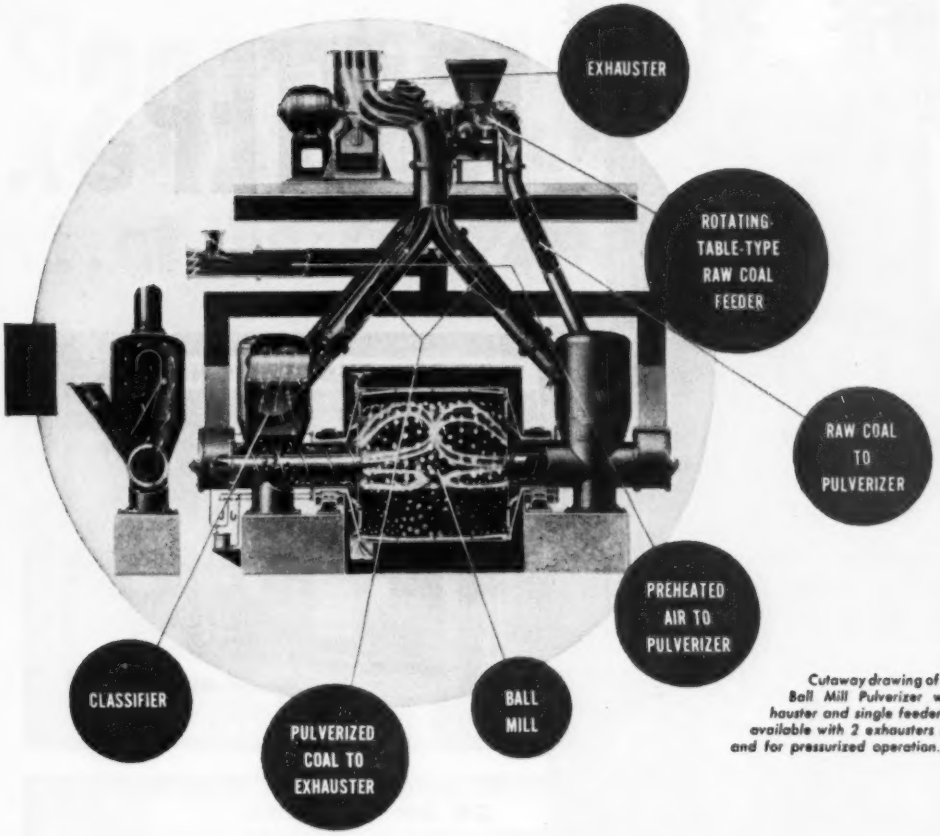
1 PULVERIZES TOUGH FUELS. **Anthracite, coke breeze, hard bituminous, as well as lignite, petroleum coke and pitch are all being successfully pulverized with reliable, easy-to-maintain FW Ball Mills.**

2 HIGH AVAILABILITY—LOW MAINTENANCE. **Operating records of FW Ball Mills show a remarkable availability of 99% or better. This means fewer pulverizers are required per boiler.**

3 CONSTANT FINENESS. **Regardless of its length of service, the FW Ball Mill pulverizes fuel to a constant fineness, maintains peak steam generator efficiency. As the balls wear, they are replaced while the mill is in service. Costly shutdowns are, therefore, avoided.**

4 LARGE RESERVE CAPACITY. **A large reserve supply of fuel is available in the mill at all times to maintain smooth, uninterrupted operation of the steam generating equipment. This reserve is adequate to provide for interruptions in raw-coal feed and to meet rapid or extensive load changes.**

FOSTER WHEELER CORPORATION,



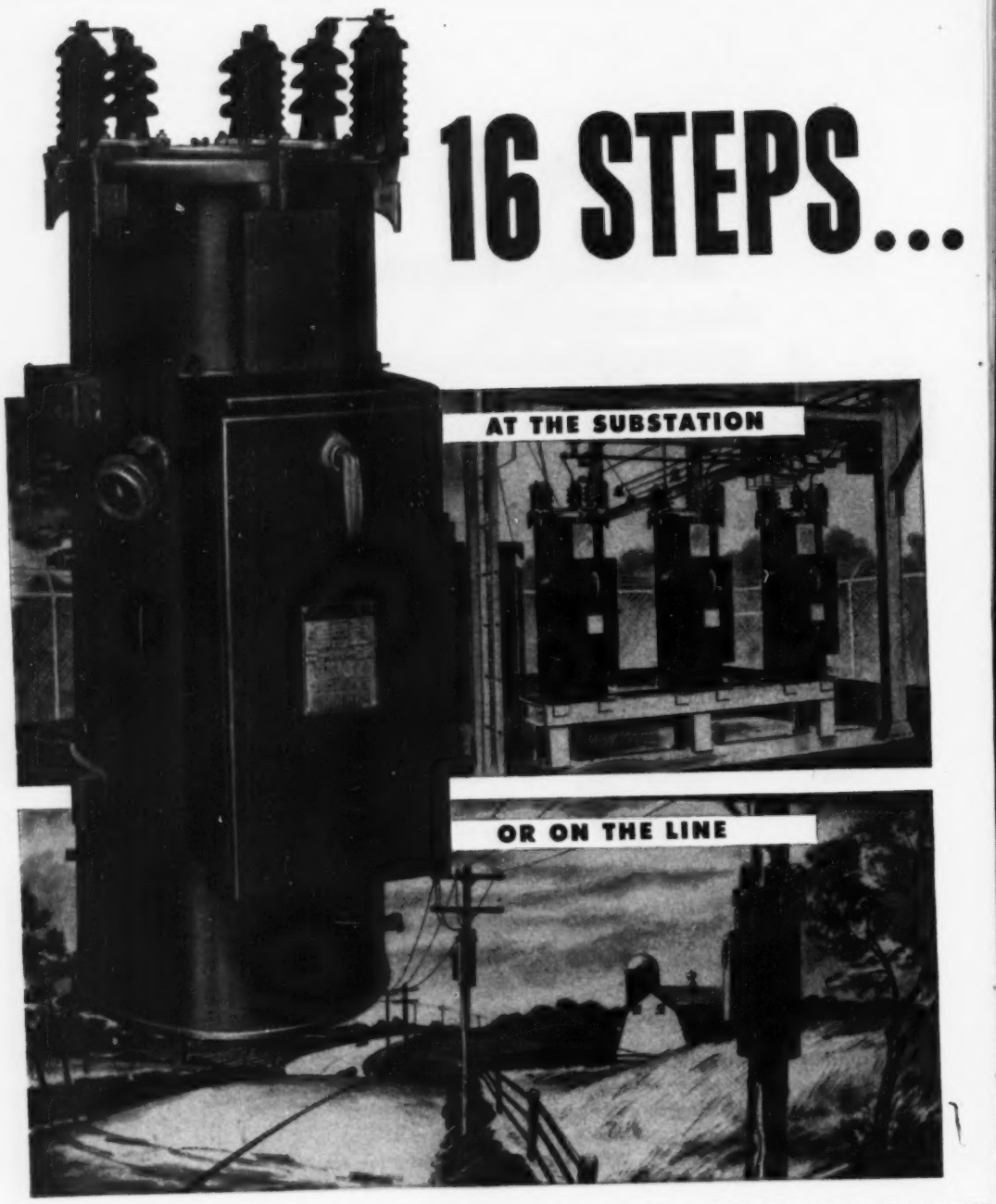
Cutaway drawing of Foster Wheeler Ball Mill Pulverizer with single exhauster and single feeder. Systems also available with 2 exhausters and 2 feeders; and for pressurized operation.

Foster Wheeler Ball Mill Pulverizers represent over 50 years of experience with pulverized fuels plus the knowledge and engineering skill gained in hundreds of successful installations.

They are complete systems with all component parts which incorporate a high degree of efficiency, availability and economical operation. Write for further information to:

165 BROADWAY, NEW YORK 6, N. Y.

FOSTER WHEELER


16 STEPS...
AT THE SUBSTATION
OR ON THE LINE

Close Regulation, Reliable Operation ...at the *LOWEST COST!*

Check these Westinghouse Voltage Regulator advantages. Compare them. The Westinghouse URL-16 with 16, 1¼ steps provides:

- Low maintenance cost . . . made possible with a minimum number of tap-changer operations and a minimum number of contacts and moving parts.
- Voltage regulation within ± 1-volt band width.
- Class 1 control accuracy.

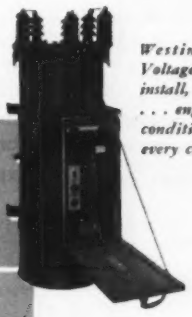
Only the Westinghouse URL-16 has these features:

1. Complete surge protection with "De-ion®" arresters on each line bushing.
2. Direct Geneva Drive Mechanism has controlled contact speed for long contact life, minimum maintenance.
3. Package control in one Flexitest® unit for maximum flexibility and interchangeability.
4. Simplified control has voltage regulating relay with integral inverse time delay.

IMPROVED CONTROL CABINET . . . Control cabinet door is hinged at bottom to provide a "workbench" when in open position. Control cabinet may be mounted integrally with the regulator or on the pole below the regulator.

FOR FURTHER INFORMATION on the new URL-16 Regulator, call your Westinghouse representative, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-70631



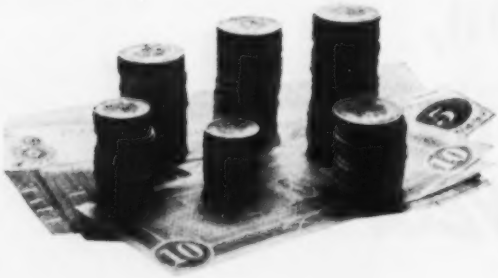
Westinghouse URL-16 Voltage Regulator—easy to install, easy to maintain, . . . engineered for every condition of weather . . . every condition of service.

YOU CAN BE SURE.. IF IT'S

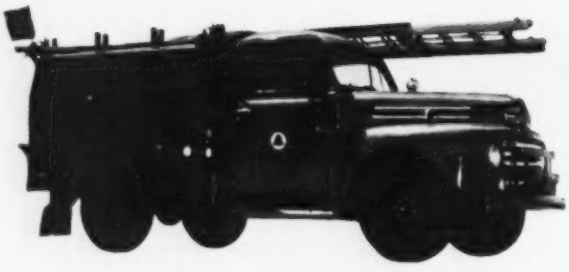
Westinghouse

VOLTAGE REGULATORS

Bell System communications save you



_____capital



_____maintenance

_____manpower

When you lease our services, at a regular monthly charge, we assume full responsibility for the planning, engineering, installation and maintenance of your communications system.

This means that Bell System communications are economical because you do not need to invest your capital in communications equipment . . . set up reserves for maintenance or obsolescence . . . and you do not need manpower for maintenance.

With more than 75 years of experience in the communications business, Bell System "know how" can meet all your needs economically with the finest and most dependable communications. We provide—by radio, wire or cable—a wide variety of services. They include private-line telephone, mobile telephone, and teletypewriter services, and channels for remote metering, supervisory control and facsimile.

Your Bell Telephone Company will be glad to study your communications problems and needs without charge.

PRIVATE-LINE TELEPHONE

TELETYPEWRITER

MOBILE TELEPHONE

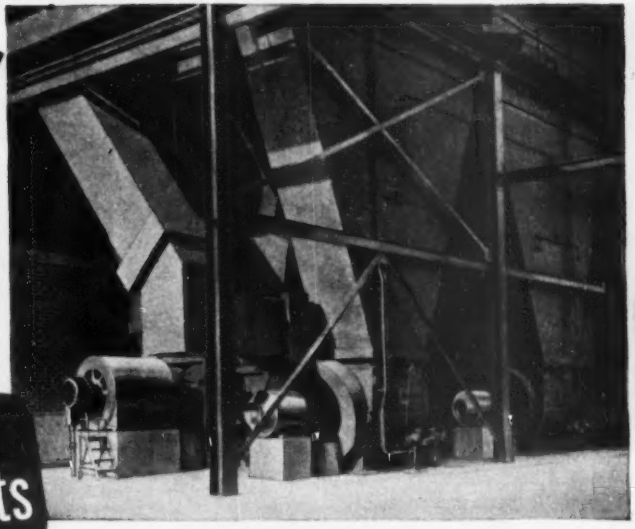
METERING CHANNELS

BELL TELEPHONE SYSTEM

STEPLESS SPEED CONTROL

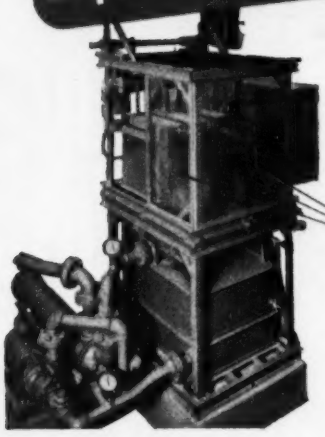
Engineered

for boiler draft fans

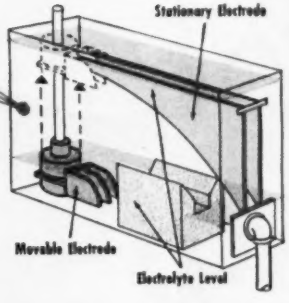


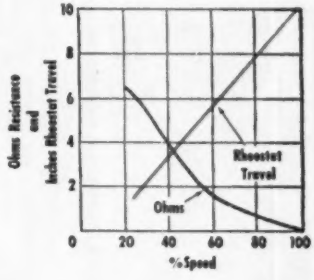
ALLIS-CHALMERS

Liquid Rheostats



FOR PROPER DRAFT CONTROL of boilers, Allis-Chalmers Liquid Rheostats are used in the secondary circuits of four 600 horsepower wound-rotor motors driving induced draft fans at the Edge Moor Station of the Delaware Power & Light Company. Direct coupling of fans and drive motors simplifies bearing alignment and maintenance problems.





TYPE 257 LIQUID RHEOSTATS can be placed in any convenient spot because only electrical connections are required. In this case, they are on the lowest floor of the power plant; the tube type TEFC drive motors are outdoors.

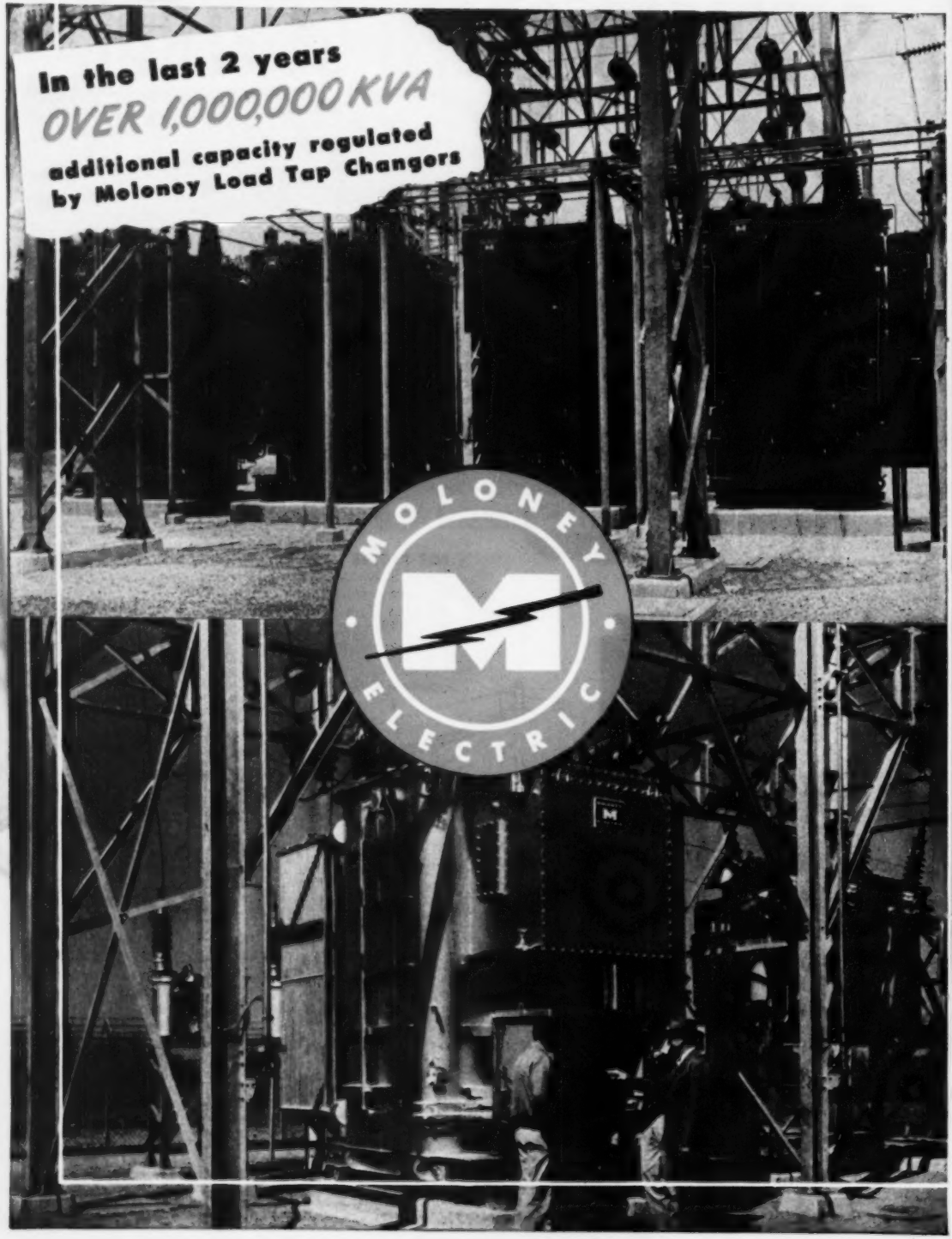
RHEOSTAT CELLS have both a movable electrode and a variable electrolyte level. The movable electrode is always completely immersed. Hot spots are eliminated by directing the flow of cooled electrolyte through the electrode plates.

STRAIGHT LINE SPEED CHARACTERISTICS are designed into these rheostats for each application. Needed resistance characteristics are built in by shaping the stationary electrode, and by fixing distance between electrodes.

ALLIS-CHALMERS

Allis-Chalmers Liquid Rheostats have but few moving parts . . . no arcing contacts. Electrodes can be actuated by electric, pneumatic, or hydraulic operators. Call your A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin for leaflet 14S7544.

A-3721

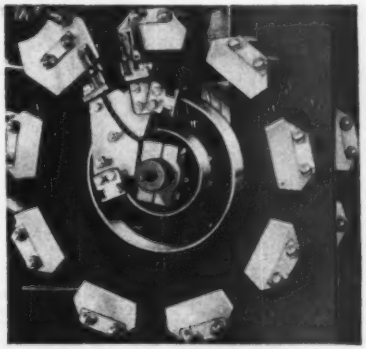

In the last 2 years
OVER 1,000,000 KVA
additional capacity regulated
by Moloney Load Tap Changers
MOLONEY
ELECTRIC

MOLONEY LOAD TAP CHANGERS

Offer these advantages for feeder voltage regulators, regulating transformers and load ratio control transformers

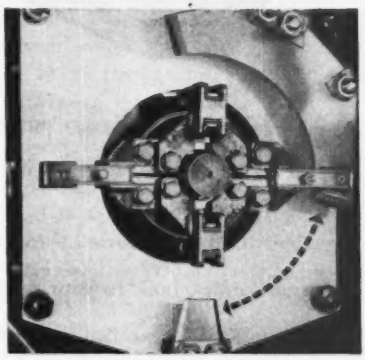
ELECTRICALLY

No arcing duty is imposed upon any of the tap selector switch contacts, avoiding the necessity for replacement due to burning or scoring. A separate switch is used for breaking load current, and a reactor in parallel with this switch during each opening and closing keeps arcing here to a minimum. Virtual elimination of arcing not only prolongs the life of the contacts but also preserves the quality of the oil in the tap changer compartment.



MECHANICALLY

The load transfer switch, which is the only switch required to transfer load current, is provided with accelerating springs and is driven by Geneva gears. The design provides a means of opening and closing the load transfer switching elements at a high rate of speed without shock to the gearing or other parts. Moloney Load Tap Changers have been inspected in the field after more than 500,000 operations and have been found to have no mechanical wear sufficient to require replacement of parts other than contacts.



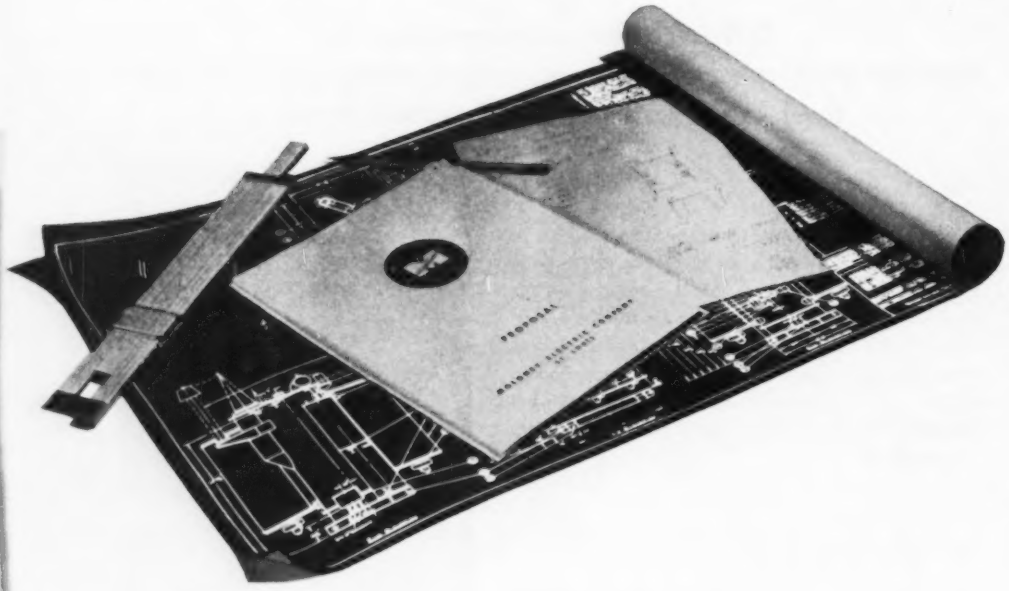
MOLONEY ELECTRIC COMPANY

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers Step Voltage Regulators • Unit Substations

M = { BETTER PERFORMANCE
GREATER RELIABILITY
LESS MAINTENANCE

MOLONEY *Better Performance* is put in writing *FIRST!*



MOLONEY engineers put your specifications, plus over 50 years of engineering experience, into a formula *on paper* first.

This formula, followed through design and fabrication, results in a transformer, built to your needs, that is test-proven before it leaves our factory. Unexcelled experience, personnel and facilities all combine to give "Better Performance" when you specify Moloney Transformers.

ME 52-7

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers Step Voltage Regulators • Unit Substations

MOLONEY ELECTRIC = { BETTER PERFORMANCE / GREATER RELIABILITY / LESS MAINTENANCE

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

Some Wiring—More Wiring

Like the poor, the problem of wiring on customers' premises is always with us. Possibly the day will come when we can wrap up the matter in a nice package, tuck it away, and forget about it. That day will come when—if ever—the present common method of getting electricity from here to there is superseded by something better. The outlook for this is not bright.

Thus the wiring problem is not one to be solved; it is a problem to be coped with day after day. But it seems that more people in the industry would rather ignore it than cope with it.

O. C. Small, manager of the National Adequate Wiring Bureau, is fond of quoting, "No wiring—no business; some wiring—some business; more wiring—more business". This bit of patter reduces the whole electrical industry to its very simplest terms. Like most simple things it is usually overlooked in preoccupation with the complexities that arise out of it, which is natural.

Electric utility management has problems, plenty of them. Decisions must continually be made in financial, engineering, administrative, personnel, and many other pressing matters.

Manufacturers of electrical goods also are beset in the daily round of their affairs. Immediate action is demanded on product designs, manufacturing methods, market determinations, labor questions, a host of things that must be attended to right now.

Distributors have their troubles, too. Either they can't get enough goods to supply retail outlets or manufacturers crowd merchandise on them until their warehouses bulge.

Dealers worry about their bank credit, about their salesmen, about their advertising, and if not about the ranges and refrigerators that seem glued to the sales floor, then about those they can't get from the distributors.

Contractors are busy making estimates on jobs, striving to iron out labor difficulties, seeing that their work conforms to Code, grappling with the many problems that continually arise in the construction field.

Utilities, manufacturers, distributors, dealers, contractors—all are too busy to think much about the very simple thing—customers' wiring—without which neither their problems nor they would exist. Oh yes, there are exceptions. If there were not, there would be no National Adequate Wiring Bureau, no 64 local organizations over the country licensed by the Bureau to issue certifications of adequate wiring installations. The fact does remain though, that the whole electrical industry does not give to customers' wiring the attention it deserves. The industry generally seems still to be content, as it has been in the past, with some wiring and some business, when it could have more wiring and more business.

If the 5,000-kwhr home is to be realized in ten years, the general mind of the industry will have to throw out the "some" idea of wiring and replace it with the "more" idea pretty quickly. Effective coping with the problem will have to begin soon.

Help Wanted—Engineers

The output of engineers from the colleges, as is well recognized, now falls far short of meeting the requirements of industry. Even though enrollment in entering classes is showing an upturn, it will still be four years before these men become available for employment. This situation will set apart the present young engineers as a group distinct from those to come.

The future of this new generation of engineers is now in the hands of their employers. Both work and responsibility must fall upon them far earlier than many realize if the industry's staggering obligations are to be met.

The ability of these young men to fulfill their obligations depends now upon the training they are receiving from their employers. Job training alone is not enough. They must be inspired with the spirit of service which has made the electric power industry great. They must develop attitudes which will permit them to supervise effectively and vision to participate in complicated problems.

These attributes, which their predecessors learned by experience, must now be acquired much more rapidly. Close working contact with those whose methods have proved successful appears to be the surest method. Older heads must apply the same spirit in guiding these younger engineers firmly through their preparation for responsibility.

Responsibility can make the man. Responsibility can likewise break the inadequately prepared man. With the future of the industry so dependent upon these young engineers, they must not be broken. Treat them wisely, whatever the cost, for there are no replacements. They need and want your help. You must heed their plea, for you cannot afford to let them fail.

Bettering Carrier Communications

Installing and operating carrier current communications on interconnected systems are by no means simple tasks. Problems of attenuation, noise, and satisfactory telephony because of variable weather, load, and switching conditions on individual systems are heaped upon the multiple-system problems of interference during tests, cross-coupling and unavailability of certain frequencies. Most effective use of carrier current communications can be had only through cooperation by all parties concerned.

The Pacific Southwest Co-ordinating Committee for Carrier Current is a step in this direction. This group is composed of ten power companies in Arizona, California, and Nevada, the Bureau of Reclamation, the Imperial Irrigation District, and the two telephone companies serving the Pacific Southwest Power Region. Under its first chairman, L. E. Ludekens of Southern California Edison Co, who sparked the move, the group has set as one of its first tasks the compilation of frequencies, power application, and location of stations and lines of member companies. This information will prove invaluable, particularly in assigning new frequencies and possible reassignment of frequencies too close for satisfactory operation by adjacent utilities.

The committee hopes to schedule routine maintenance tests so as to cause the least interference on nearby lines. In addition, it will serve as information center for such subjects as the FCC Docket 9288—proposed Part 15 dealing with carrier frequencies.

The possibilities suggested by this cooperative effort are numerous. But the net result should be maximum and most effective use of carrier current communications by all utilities concerned.

Sites for Future Power Plants

Utility executives should take steps now to secure sites for future power plants, not for those needed in the immediate future but for those that must be built ten to twenty years from now. One will ask, "Why this haste?" In answer, suitable sites are becoming scarce, and the freedom of selection is limited. Several utilities have been barred from central locations. They have had to locate new plants in country sections far from load centers and from service facilities.

There is a growing tendency for those living near a proposed site to object to the construction of a steam power plant at that location. Objections have included depreciation of nearby property values, unsightliness of coal piles and chimneys, dust and gas discharges, air pollution, and attendant noise. Waterfronts near large cities are being built up with homes and summer cottages. Owners of these places are taking more positive stands against power plants near their premises. Should certain legal actions now pending be sustained, it may be almost impossible for utilities to secure suitable waterfront properties. This is particularly true for proposed plants near large cities on the Atlantic seaboard and the Great Lakes.

Property values continue to increase. Even at present prices, land purchases now may prove an excellent investment over a period of years even if not used during that time. With these several considerations in mind, it is prudent to secure now desirable waterfront properties for sites that will care for utility growth in the distant future.

Where Is the Load Pick-up Problem?

Engineers have recognized that the motor-starting currents of present-day appliances can cause difficulty in restoring service after distribution circuit interruptions. Several proposals for alleviation of this difficulty have been offered, ranging from relay modifications to automatic sectionalizing. The fact remains, however, that it is difficult to ascertain which circuits require attention.

Because of the marked similarity between the pick-up current of a circuit having considerable motor load and the current flowing into a distant fault, operating personnel rarely recognize a pick-up problem. Where the circuit originates in a non-attended substation, as is the trend, then only the relays are present to recognize it. Lacking complete data of connected motor load, engineers have been equally hard-pressed to determine where difficult pick-up may be anticipated. The result is that little progress has been made in solving the problem while the continuing installation of motor-driven appliances makes all distribution circuits increasingly subject to trouble.

We would not detract in any way from the methods already proposed to overcome the pick-up problem. Doubtless new and more effective solutions will be developed, but these developments apparently will still leave unsolved the method of selecting circuits which require their application. Such data as load current, voltage, connected transformer capacity, and circuit miles are usually available. The pressing need now is a simple technique for screening these data to determine where the pick-up problem is.

THE ELECTRICAL WEEK

The Issue's News Highlights—Kinsey Robinson, president of Washington Water Power Co, submits his company's offer to buy in Puget Sound P&L. Frank McLaughlin says the offer has "no merit whatsoever," and wants to go ahead with proposed sale to six Washington PUD's. Puget Sound stockholders will decide the question Oct. 27 in Boston.

"Missouri Case," involving suit against REA and SPA by ten power companies, goes to trial. Question: Has Congress been by-passed in REA-SPA contracts with "G&T" cooperatives?

Latest from Washington—FPC and Interior Department will have 1½ hours each to argue the Roanoke Rapids case before the Supreme Court on Oct. 22 . . . Washington Water Power Co has been given an extra year in which to make studies and surveys on proposed Noxon Rapids project on Clark Fork River in Montana preliminary to applying for a federal license.

Roundup of the rapid tax amortization shows that 543 certificates of necessity have been granted electric companies on facilities costing an estimated $3.3 billion. DPA guesses that about 48% of these facilities are already in place.

League of Iowa Municipalities has voted 18-to-15 against supporting a Public Utilities Commisison in Iowa. In 1951 the league had voted for such a commission.

Abbeville, La., citizens vote 820-to-107 to reject sale of municipal system to Gulf States Utilities for $1,250,000.

Ohio Valley Electric Corp and AEC sign $400-million power contract. Two stations will be built on Ohio River: One with 1 million kw between Portsmouth and Marietta, Ohio, another with 1.2 million kw between New Albany and Lawrenceburg, Ind.

From New England—Payments have been temporarily held up by Burlington, Vt., on construction at site of city's new $4-million steam plant pending an independent engineering study of financial status and abilities of designers and contractors in charge of the development. City is meeting the cost of manning wellpoint stations to keep water out of the foundations of the job.

From Middle Atlantic—Niagara Mohawk Power gets NY PSC approval to acquire Edwards L&P for about $65,000.

From East North Central—Bellaire, Mich., citizens vote 176-to-117 to sell municipal system to Consumers Power Co for $87,500. A total of 175.8 votes (3/5) of 293 cast were needed to approve the sale. Another election in December will decide whether the hydro plants should also be sold . . . Dayton P&L offers Miamisburg (Ohio) City Council $792,595 for its electric system. City will hold hearings before taking final action.

From Far West—Westcoast Transmission Co gets Ottawa Board of Transport Commissioners' approval to build a natural gas line from northern Alberta-British Columbia border area to Vancouver, B. C., and British Columbia-U. S. border. It now has to get FPC approval . . . Pacific G&E and California Oregon Power get PUC approval for Pacific to deliver power from its Pit No. 1 plant to COP for about $397,946 annually . . . Establishment of a special organization of engineers and lawyers to study California's proposed purchase of federal Central Valley Project has been authorized by state's Water Project Authority.

Financial—Hartford Electric Light plans to sell $15-million bonds sometime this fall . . . Wisconsin Electric Power sells its transportation subsidiary to a new independent company, Milwaukee & Suburban Transport Corp for $10 million . . . Electric Bond & Share will pay Dec. 29 a dividend of two common shares of Washington Water Power for each 100 common shares of EB&S.

Stockholder Subscriptions—Long Island Lighting common stockholders subscribed for 584,935 (97.5%) of 599,942 shares offered in ratio of one new share, at $15.50, for each seven shares held. Balance 15,007 shares taken by underwriters, Blyth & Co group.

Labor—Three-man commission appointed by Michigan's Governor Williams has recommended a pay raise of 10¢ an hour instead of 6¢ offered by Detroit Edison. Union had requested 15¢.

Rates—Hartford Electric Light gets PUC approval to up rates about $1.6 million annually effective Nov. 1 . . . Consumers Power reduces rates by about 6% in 15-county area formerly served by Michigan Public Service . . . Georgia Power Co gets PSC approval to raise rates by $1,604,000 net annually ($2,112,000 gross less $508,000 for 10% discount on bills for prompt payment to be dropped) as compared with $4.6 million requested.

Manitoba Hydro Electric Board is negotiating for purchase of electric system of Winnipeg Electric. It is reported the price will be around $54.9 million, the valuation placed on property by Clarkson, Gordon & Co who was retained by the city to make it.

Congratulations—Tax Executives Institute elects as president, Thomas E. Hurn, secretary and general accountant of Detroit Edison . . . L. F. Hickernell, chief engineer of Anaconda Wire & Cable, is appointed chairman of technical program committee for 1953 winter general meeting of AIEE . . . Petroleum Electric Power Association elects as president, Ned W. Beaudreau of Central P&L of Corpus Christi, Tex.

Public Utilities Association of the Virginias elects R. E. Hodges, division manager of Appalachian Electric Power, president; E. H. Will, vice president of Virginia E&P, first vice president; and A. J. Bowen, division manager of Northern Virginia Power, second vice president. Association also elects Robert W. McKinnon full-time executive secretary, succeeding A. Bliss McCrum retiring Dec. 31.

Kinsey Robinson proposed WWP buy Puget Sound P&L

Frank McLaughlin said scheme had 'no merit whatsoever'

But the question remains:

Will Puget Go Public or Private?

Whether a private power company will continue to operate in western Washington will be the basic question put to stockholders of Puget Sound Power & Light Co, Oct. 27 at Boston. It is then that they vote upon the proposed sale of most of Puget Sound's remaining properties in the state to a group of six PUD's.

Forcing the question is Washington Water Power Co, Spokane, which has proposed a merger of the two companies. WWP's offer is expected to be attractive to many stockholders of the Seattle company. It allows the stockholder to exchange two Puget Sound shares for two shares of WWP, selling about $26.50 a share, or to receive one share of WWP and $27.50 in cash for each two shares of Puget Sound stock.

Stockholders accepting two shares of stock could escape the capital gains tax that would bite into their proceeds from an outright sale to the PUD's. That sale would amount to an estimated initial payment of $22 a share.

Which offer? . . . The PUD offer, about $94 million, must be approved by 2/3 of the 2,177,879 outstanding shares of Puget Sound. If WWP's offer of one share of Washington stock plus $27.50 for two shares of Puget Stock is accepted by all Puget stockholders, this would call for about $30 million in ready money. Kinsey M. Robinson, president of Washington Water Power, has reported that tentative financing has been arranged to raise this amount.

McLaughlin Opposed . . . Frank McLaughlin, Puget Sound president, who previously declared the day of private power in western Washington has passed, immediately criticized the "merger scheme" as having "no merit whatsoever" and being "obviously and simply an attempt to block consummation of the six-district acquisition." Harvey Benson, chairman of the PUD group, declared that adoption of the proposal would appear to be "disastrous for both stockholders and rate payers".

Favorable to the WWP offer is a feeling that things will be different in the state should the Republicans win in November. Not only will public power groups have more difficulty in obtaining cheap money now readily available, observers believe, but also they will be given a larger share of the tax burden. Business interests in Washington State are expected to propose to the 1953 state legislature a revision of the tax structure that would narrow the margin of favoritism of of public power agencies over private companies. The legislature will be asked to put public power agencies under the state Public Service Commission, in common with private companies; to abolish the PUD Act; to eliminate PUD's which have been formed but never activated; and to force PUD's to refer revenue measures to popular vote.

President Robinson, in transmitting the offer to McLaughlin and Puget Sound directors, expressed a belief "that the proposed merger would effect substantial operating economies for the merged company and otherwise be beneficial to all security holders of both."

He declared, "Many stockholders of both companies have insisted that WWP submit some kind of proposal to keep the Puget property in private ownership for the benefit of stockholders of both companies."

These stockholders represent a substantial number of shares of common stock of both companies, he said. The plan was made public without first "sounding out" Puget directors and stockholders because of the so-called "full disclosure" rules of SEC, according to Robinson.

Would Retain WWP Name . . . Under the merger proposal, the new company would retain the name, Washington Water Power Co, presumably with Robinson remaining as president. Employees of Puget Sound would be entitled to pay and pension benefits of WWP.

In criticising the merger plan McLaughlin said, "There is no assurance that such a plan could be consummated, even if the parties agreed upon the terms, because of necessary stockholder and regulatory approvals and extensive litigation by public power interests which would undoubtedly follow.

"A merger with Washington would not in any sense remove the basic causes for Puget's present difficulties

—it would make the situation more hazardous, put Puget in a worse plight than is now the case, and the company's stockholders would be irreparably damaged by an ill-fated attempt."

Prior to submitting the PUD's purchase offer to stockholders, he added, Puget's board of directors fully explored the feasibility and the practicability of a merger with Washington and decided the interests of all concerned were best served by a sale of Puget's properties to the six districts.

"There is nothing in Washington Water Power's communication which warrants any change of attitude by Puget's board of directors," said McLaughlin.

Should Puget stockholders decide to accept the WWP offer, PUD's will reopen condemnation suits against the utility in Thurston, Jefferson, Grays Harbor, Kitsap and Skagit counties, according to PUD Chairman Benson. Various municipalities with suits pending also might be expected to press their actions.

"While condemnation would mean disaster to stockholders, a merger would be even more disastrous to rate payers because Washington would inevitably ask a rate increase," said Benson.

He describes Robinson as a man "who deals in high pressure politics" and who "would drive new industry into eastern rather than western Washington."

Warns on Loss . . . Benson added that under the merger western Washington customers would be deprived of cheap public power and that the private company would have to continue to turn down new industries in the Puget Sound area because it couldn't supply them with power.

McLaughlin's attitude toward the proposal won quick support from at least two Seattle members of his board of directors, speaking as individual stockholders rather than as directors of WWP.

D. K. MacDonald pointed out that obtaining approval of the boards and stockholders of the two companies, as well as regulatory agencies, might require considerable time. He described the offer as "more like a proposition to muddy up the waters than a legitimate offer."

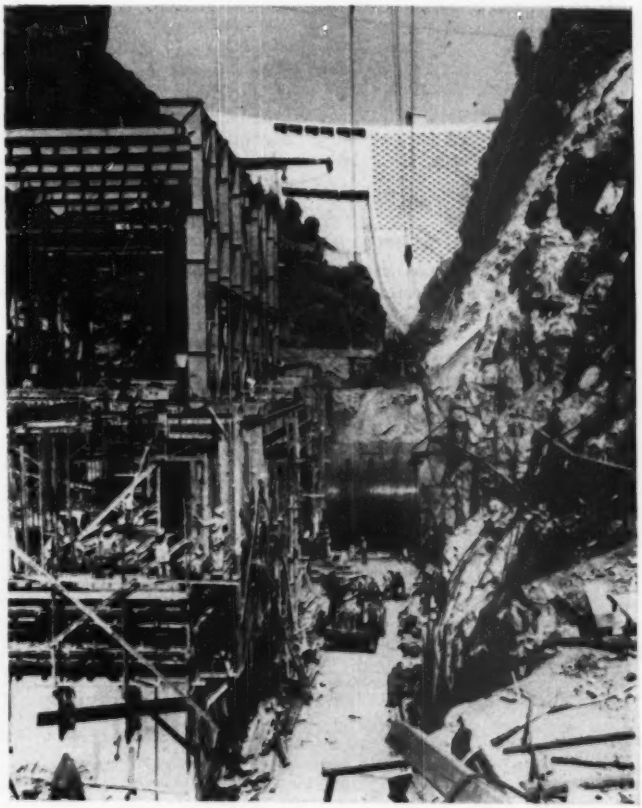
Joshua Green declared, "The best proposition for the stockholders of Puget Sound and the public is this deal the PUD's have made. PUD power of condemnation makes it hard for private companies to operate."

The PUD purchase plan is a Nov. 4 election issue in two of the six participating PUD's. In Skagit and Kitsap counties, voters will choose between a candidate for and one against the proposed $93-million purchase of Puget properties. In each of these counties, one holdover commissioner opposes the purchase, so election of another anti-purchase commissioner would give the opposition a majority on the three-member board.

Should Puget Sound stockholders approve the PUD purchase, McLaughlin undoubtedly will be asked to manage the PUD power pool. At least three newspapers in the area recently have advocated such an appointment.

McLaughlin is under contract to Puget through 1954, or until a year after the company has been sold, at $60,000 a year. However, the company probably would release him if the bond syndicate should stipulate that he manage the PUD power pool. McLaughlin will not comment until the sale is concluded.

Meanwhile, Skagit County PUD has leased a building in Burlington as temporary housing for its expanding operation should Puget's purchase be approved.



Tunnel Work at Skagit River Plant

Penstock liner sections are ready for insertion into tunnels at Ross Dam power project on the Skagit River being constructed by Seattle City Light. The powerhouse will double City Light's hydroelectric capacity. Two tunnels 24 ft in diameter lead from the Ross Lake intake, each dividing into two tunnels 15 ft in diameter. First of three 90,000-kw generators is expected to go on the line Dec. 15 with the second and third scheduled for Feb. 1 and May 1. Dam is in background, power plant at left.

'Omissions' Charged to Truman

EEI head tells Indiana Electric Association President left out drawbacks of federal power in his Hungry Horse speech

President Truman painted in only the highlights and left out the shadows on the federal power canvas when he addressed his audience at the dedication of Hungry Horse Dam in Montana, Bayard L. England, president of Edison Electric Institute, declared last week. He spoke at the annual convention of Indiana Electric Association in French Lick.

At the dedication, the President had said Hungry Horse stood as a symbol of the long-range federal program for multiple-purpose development of the Columbia River drainage basin. He asserted multiple benefits would result from the program.

In his talk, England sketched what he termed the "principle errors and omissions" in the President's picture.

"The expansion of federal government into river basin development in the past 20 years," he said, "has injected a federal domination and control at the expense of our local systems of government and of individual freedom and initiative. The two things are incompatible."

Cites Wilson . . . England said Charles E. Wilson, former defense mobilizer, had pointed out that a material portion of the shrinkage in the purchasing value of the dollar was chargeable to the huge federal projects.

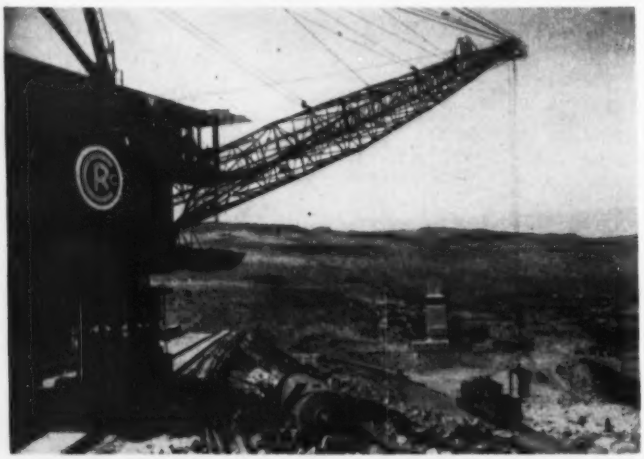
"The inclusion of economically unjustified projects, the gross underestimation of cost and overstatement of benefits, and the sale of electric power from the projects at about half the real cost . . . have been factors in this omitted and unfavorable truth," he commented.

The EEI president asserted that in most instances if federal power were priced at its true cost it would be offered above the prevailing market price.

Another omission, England charged, was that the federal government has gone into business on "a grossly unfair basis."

Federal power, he said, is granted an avoidance of federal taxes amounting to an average 14% of the gross revenue dollar of the power companies and escapes local taxes amounting to another 9%.

"Since taxes are paid by consumers," he commented, "this means that 80% of the consumers of America are selected to pay taxes on electricity, and 20% are given special preference."



Hauling Concrete at Chief Joseph

Large dragline is used to place concrete for the intake structures for the powerhouse at Chief Joseph Dam on the Columbia River near Brewster, Wash. The dragline, with its 200-ft boom, is shown lifting a 4 cu yd bucket of concrete from the rail car which has taken it from the batch plant in the background.

The powerhouse will be constructed in the excavated area to the left of the intake structure. The structure will provide space for 17 generating units, the first four of which rated at 256,000 kw are scheduled to go on the line in December, 1955. The powerhouse eventually will be extended to house 27 units.

Supreme Court May Rule in Colorado River Dispute

The Supreme Court may decide during its current session whether it will arbitrate the long-drawn-out dispute over division of Colorado River water which has developed between Arizona and California.

A firm claim to a large portion of the water is considered to be a first step in undertaking the huge Central Arizona Project—a billion-dollar project which involves extensive irrigation and power features (EW, Aug. 11, p 112).

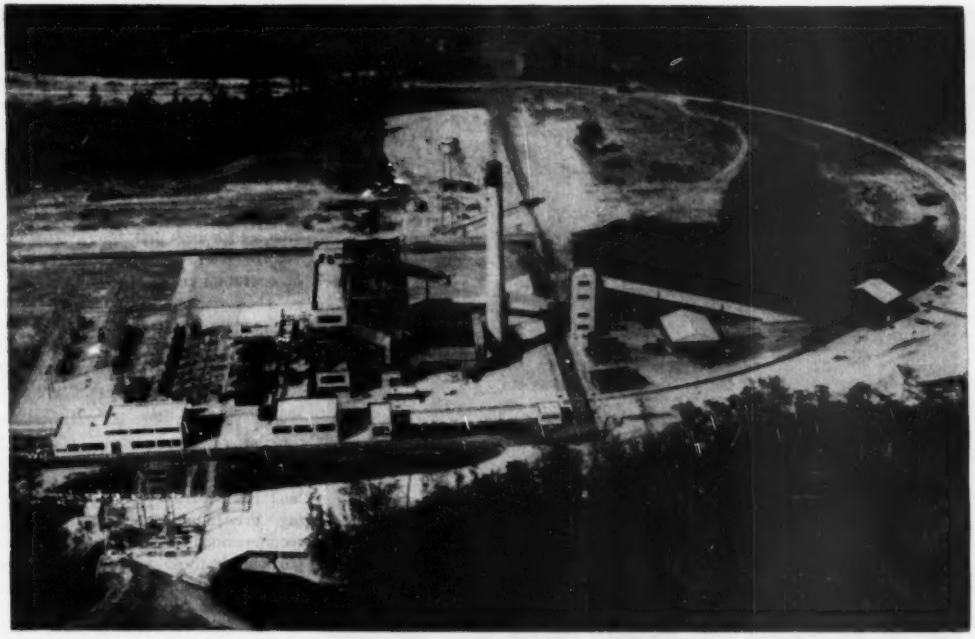
In an order issued last Monday, the high court gave California 60 days to state why the court could not examine the dispute. Upon receipt of the California statement, the court would likely schedule arguments on whether it should arbitrate the matter.

The federal government, which also has an interest in the disposal of water from the navigable Colorado, may intervene if Arizona does file a complaint.

Despite three previous complaints before the Supreme Court in this case, Arizona has never obtained a decision in its favor.

Army Unit Buys Power

Dugway Proving Grounds, the Army Chemical Corps' test area and munitions production plant in the Utah desert, has recently switched over to the local commercial power company as its source of industrial and lighting electricity. Heretofore the base has furnished its own power with generators, but a recent check disclosed that the Army could buy its power cheaper than it could produce it. However, the base will retain its own generators on a stand-by basis, in the event of a power failure.



MODERN OUTDOOR STATION . . . Lumberton Station of Carolina Power & Light Co reflects current plant design

Today's Trends in Steam Plant Design—II

Machine Needs Pace Excitation Progress

Geared or separately-driven exciters replace direct-connected units as size and speed of turbo-generators increase. Electronic excitation reappearing.

J. B. McCLURE and **A. G. MELLOR**
General Electric Co, Schenectady, N. Y.

When 1,800 rpm was the most common speed for turbine-generators, direct connected exciters were almost universally used. But the development of large 3,600-rpm turbine generators advanced faster than experience could be gained on large direct connected exciters. Thus today for the largest 3,600-rpm generators either geared exciters or separate motor driven exciters are being used.

As an alternative to either direct connected or geared exciters, motor driven exciters have been developed with characteristics giving generator performance equal to that obtained when using direct connected exciters.

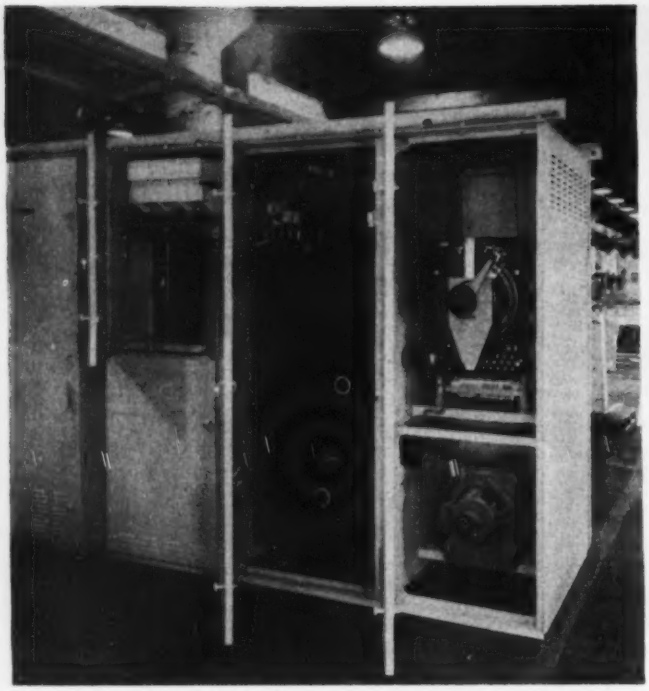
These motor driven exciters have a high torque induction motor and have added inertia. The high inertia aids in maintaining the speed of the set during system disturbances in which the voltage at the terminals of the motor may be very low or even zero. This prevents these disturbances from reflecting in the generator output.

The high torque characteristics of the driving motor enables the exciter set to recover normal speed rapidly after a disturbance and also permits full excitation to be obtained with the voltage at the motor terminals as low as 70% of normal.

Electronic Exciters . . . Several years ago, electronic exciters were applied to several synchronous condenser installations. Experience gained on these installations indicates that this type of exciter is reliable and gives very satisfactory performance. Tube life is now about five years. Because tubes are in parallel and can be replaced in use, no spare exciter is required.

If a sufficiently high ceiling is incorporated in the design of the electronic exciter, excitation system performance can be obtained that is as good as that obtainable with a high-inertia, motor-driven exciter.

The electronic exciter meets the requirements of operators who have had unfavorable experience with rotating machinery using commutators. Power



MODERN EXCITATION CUBICLE with controls and amplidyne voltage regulator

supply for electronic exciters has sometimes been obtained from a separate alternator directly connected to the turbine generator shaft. This alternator has in turn been excited by a direct-connected, permanent magnet generator. But this method of obtaining the power supply is complicated and expensive.

The electronic exciter should be considered as simply another essential station auxiliary and supplied from the station auxiliary power system. With this simplification of power supply and the good performance record of electronic exciters in service, it is expected that their use will increase in the future.

Spare Exciters . . . Practice in the provision of spare exciters varies with different operators. Many users consider that modern exciters are sufficiently reliable that no spare need be available. In other cases, a generating unit may be considered so essential that every precaution is taken to prevent an outage.

In cases where a spare exciter is considered necessary, it can be a simple type of motor generator set with no automatic voltage regulation. A single spare exciter can be used for several units in a station, provision being made to connect the spare exciter in place of any direct connected exciter. As previously mentioned, when electronic exciters are used, no spare exciter is necessary.

Stations having cross-compound turbine generator sets require a motor-driven exciter for starting the units. While at rest the two generators of the sets are connected together and approximately no load excitation is applied to the fields. Then steam is admitted to the high pressure unit, and the two units come up to speed synchronously. The size of the motor-driven exciter required for starting is approximately that required to supply no-load excitation to both the high and low pressure generators.

In single unit stations, this same exciter set can be used as a spare for either of the direct connected exciters providing its rating is coordinated with the maximum requirements of either generator.

In stations having several cross compound sets, if a spare exciter is required, it will be necessary to have two motor-driven exciter sets so that one can be used as a spare at the same time that the other is being used to start another turbine generator set. Two excitation busses are required with one exciter set on each bus and provision for connecting the field of any machine to either bus. This arrangement provides greater flexibility and reliability than providing an exciter set for each unit. Interlocking can be provided to minimize the possibility of operating errors.

When excitation busses are used, the excitation voltage for the first machines in the station should be selected on the basis of the voltage required for the largest machine that will ultimately be installed.

Preheating Fields . . . Spare motor-driven exciters can be used to preheat the generator field before starting. Preheating of generator fields is recommended on all large generators, particularly those with long rotors, to allow the field winding to expand freely before being clamped in place by the high centrifugal forces developed at full operating speed. Electronic exciters can also be used for field preheating without providing any spare exciter providing the power supply for the exciter can be obtained from the station auxiliary bus.

Excitation Voltage . . . Until recently, 250 v was the most commonly used excitation voltage. For machines above about 100,000 kva, the currents that must be carried by the field windings and the exciter commutator at 250 v becomes excessive. To reduce the cross-section of the field winding and the duty on the exciter commutator, generators larger than 100,000 kva should have 375-v fields. In planning new stations, if it is thought that later machines may be larger than 100,000 kva, consideration should be given to using a 375-v excitation system on the first machines even though they are smaller than 100,000 kva. The very large generators of the future may possibly be designed with excitation voltages higher than 375 v.

Studies of the operation of power systems under both normal and abnormal conditions and practical operating experience have indicated the desirability of using voltage regulators on generating units. Recognition of this fact has brought about a rapid increase in their use. Heavier system loadings now being used make it more

important that all generating units be equipped with voltage regulators to improve system operation and also to relieve the station operator of the responsibility for voltage control.

Rotating Amplifiers . . . Many older turbine generator units have been equipped with rheostatic-type voltage regulators using a pilot exciter directly connected to the turbine shaft. These regulators have given excellent service and will continue to give very satisfactory performance.

For new installations another type of voltage regulator using a rotating amplifier is available. This regulator acts in the field of the main exciter and eliminates the pilot exciter. It is a continuous acting regulator with no dead band. A lower limit circuit can be supplied with this regulator to prevent excitation on the generator being reduced below a predetermined safe level.

All of the excitation system equipment not forming a part of the turbine-generator set can now be mounted in a factory assembled cubicle. These excitation cubicles include a generator field switch, field discharge resistor, exciter field rheostat, the static circuits for the voltage regulator, and the motor driven rotating amplifier. When additional field switches are required for spare exciters, these can be mounted in an additional section of the cubicle.

Main Power Connections . . . Cables have been used for many years for carrying power from the generator to the step-up transformer or to the generator switchgear. This practice will undoubtedly continue in some cases, particularly for smaller machines or where the generated power must be carried some distance outdoors. The trend, however, is definitely toward the use of isolated-phase, metal-enclosed bus run. This equipment is a modern concept of the old idea of phase segregation by concrete barriers which was widely used many years ago.

Isolated-phase bus run is available in factory assembled three-phase sections, either straight, right angle bends, or T-sections as required and is suitable for either indoor or outdoor installation. Provision can be made for tap-offs for the auxiliary power transformer, potential transformers, and surge protective equipment, when used, with complete phase segregation maintained. Increased reliability and low maintenance of bus run justify its use for important power connections, particularly if the run is relatively short.

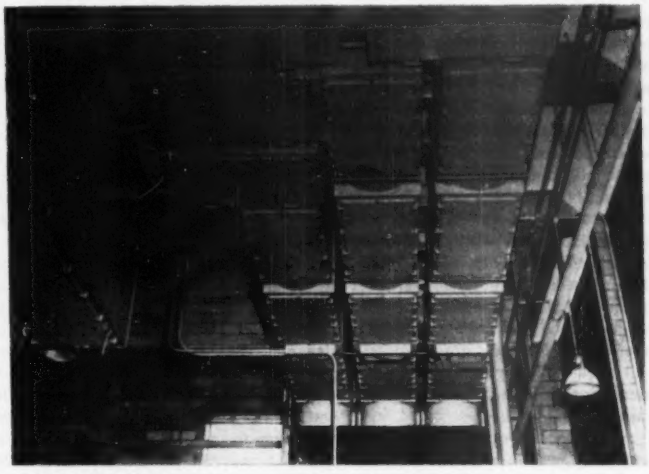
Main Power Transformers . . . With the unit system of connections it is important that the rating of the main power transformer be selected so that the full output capability of the plant can be realized. Auxiliary power is generally obtained from the terminals of the main generator, which reduces the kva output requirement of the main power transformer with respect to the main generator output. For these conditions it is suggested that the transformer output kva be selected conservatively so as to be not less than about 93% of the maximum capability of the generator. In recent practice this has been equivalent to about the 15 psi kva capability of the generator. Where auxiliary power is obtained from another source, then the transformer kva should approach the maximum capability of the generator.

Modern power transformers have an excellent service record, and as a result the early preference for single phase units has largely disappeared. Three-phase units have a lower initial investment, lower losses, lower exciting current, and lower installation cost. The result is a decided trend in the industry to the use of three-phase power transformers. In some cases for large units, two three-phase transformers operating in parallel and connected to the system through a single breaker have been used. In other cases involving very large units at high voltage it may be economical to use single phase transformers.

Forced Cooling . . . In recent years continued emphasis has been placed on the development of forced cooling of power transformers, resulting in designs using less critical material and of smaller weight and size. As the forced cooling becomes more intense the first cost continues to decrease, the core loss goes down, the copper loss increases and the preferred reactance increases on the output kva rating.

Transformer Ratings . . . Transformers are rated in output kva at a rated output voltage which in the case of a generating station will be the system high voltage nominal rating. The voltage rating of the low side of such a step-up transformer is the voltage based on its turn ratio. Thus in practice it is customary to specify a low side transformer voltage lower than the rated generator voltage so that when rated generator voltage, kva, and power factor are impressed on that low voltage winding, rated voltage will be obtained on the high side.

The transformer designer knows that in order to get rated output voltage at rated output kva on the transformer, a higher than rated voltage must be impressed on the low side by an amount that depends on the transformer reactance and on the power factor of the output kva. Thus in the



ISOLATED PHASE BUS used for generator leads in large new station

past it has been customary to specify a low voltage rating of 13.2 kv for transformers that will be supplied by a 13.8 kv generator.

Four 2½ % taps are normally provided on power transformers, with two above and two below normal. This practice allows for system growth, with corresponding change in voltage level, to be accommodated without any basic change in the voltage at which the generators will be normally expected to operate. Generators are designed for operation at rated kva with a ± 5% change in voltage and where system voltages are reasonably well stabilized this range in generator voltage control may be adequate. Several users by more extensive system planning are taking advantage of these conditions and are purchasing step-up transformers without high voltage taps. This results in reduction in transformer cost and a simplification in transformer design.

Reactance of Transformers . . . At a steam electric generating station there appears to be little excuse to specially select the reactances of the step-up power transformers. Transformers are normally available for any given size and voltage in a range of reactances, but unless specified they will be designed in the lower portion of this range. Naturally as the voltages are increased and as forced cooling is employed, the entire range of reactances goes up.

Turbine generators themselves have low transient reactance so that transient stability is very seldom a problem and special low reactance transformers are rarely required. The only reason to consider high reactance transformers would be to reduce the high voltage, short circuit duty. As units are added to the system, extra high lines are involved; and additional stations will be built. In general then the short circuit duty must be faced with breakers of adequate rating, rather than by the minor gains that are available through high reactance transformers. Furthermore, high reactance transformers impose a greater range in generator voltage with changes in load and power factor, and therefore the selection from this standpoint should always be made in the lower portion of the available range of reactance.

Insulation Level . . . The practice of using a basic insulation level which is one step lower than standard for rated circuit voltage of 115 kv and above is being generally accepted. Several factors have contributed to such a practice.

First, the protective ability of modern lightning arresters and overhead ground wires is generally recognized. Second, it is generally desirable to ground high voltage systems, thus permitting the use of a lower voltage rated arrester. Third, equipments are now built to withstand specified impulse tests. Fourth, the protective margin between a one step reduced BIL and grounded system arrester is equal to or greater than the protective margin between a standard BIL rating and an ungrounded system arrester.

Practically all main step-up transformers are simple two winding units. The low side is usually delta connected, and the high side is Y connected for grounding of the high voltage system. This connection prevents any third harmonic voltages produced by the generator from appearing on the high voltage system.

In some systems where there are many transformer banks that may be grounded, it is possible to obtain a line-to-ground short circuit kva in excess of the three-phase short circuit. This may be avoided by not grounding all the transformer neutrals. But those not grounded should have a higher insulation level at the neutral. For example, a 46-kv-rated neutral on 138-kv, line-to-line rating will be adequate and should have an arrester at the neutral. In order to give complete flexibility then all future transformers should be purchased on this basis.

Generator Neutral Grounding . . . The many different opinions on grounding of generator neutrals have been summarized in a recently published report. (Application Guide for the Grounding of Synchronous Generator Systems—AIEE Paper 49-281).

Further reduction of ground current is possible with a neutral reactor up to a rato of X_o/X_1 equal to 10 during the fault condition, but these higher values of neutral reactance result in higher dynamic voltages on the unfaulted phases.

Still further reduction in current should be accomplished with resistor grounding in order to avoid excessive transient overvoltages on the occurrence of a fault.

Delta Low Side . . . The widespread adoption of the unit system with a delta connected low side step-up transformer eleminates the necessity of having current selectivity for relaying. Any ground detection method will suffice to detect a ground in the generator, its power connections, or in the low voltage winding of the transformer, and to trip off the unit practically instantaneously in case of a ground fault. There has been widespread acceptance of the distribution transformer and secondary resistor for grounding the neutral of generators in this type of system. Very low currents, in the order of 10 amp are permitted to flow on a ground fault; hence fault damage is practically eliminated, and the chance of a fault spread to involve other phases is greatly minimized.

This high impedance grounding does require the use of higher rated arresters but this less adequate protection is generally discounted in favor of the reduced fault current.

Auxiliary Power Systems . . . A steam-electric power station in general consists not only of such major items as boiler equipment, steam turbine-generator units and condensers, but also of many auxiliaries. These auxiliaries now have come to be almost exclusively a-c motor driven, although steam-driven auxiliaries are occasionally used in some topping installations where their use improves the heat-cycle and in other cases for standby service. Because the reliability of a station can be no better than the reliability of its auxiliaries, the power supply system for these auxiliaries, as well as the associated motors and control, become important items in the design of a steam-electric power station.

In recent years there has been a marked rise in the quality and acceptance of factory-assembled switchgear, control, and transformer equipments. By the proper design approach based on available factory-assembled equipment, a new and higher level of reliability, economy, simplicity both in installation and operation, and safety to personnel can be readily obtained on these modern auxiliary power systems. From the large number of steam electric installations made during recent years a reasonably obvious pattern has developed on these auxiliary power systems. This development trend will be summarized in an ensuing instalment.

'Missouri Case' Goes to Trial

Hearings open in suit in which ten utilities charge REA, SPA contracts with five co-ops overstep bounds of two laws

A crucial court battle continues in Washington this week to determine the administrative limits of Rural Electrification Act and Flood Control Act. At issue is whether REA and Interior Department have violated these acts in contracts with five generating and transmission cooperatives, as charged by ten Missouri utilities bringing suit.

Court Developments . . . As action began in the "Missouri Case" last week in district court there were two developments that may portend the trial's course, but not its outcome:

- A contention by attorney for the companies that evidence should be allowed which may indirectly bear on a charge of conspiracy among the defendants, even though the conspiracy issue has been eliminated from the present trial.
- An hour-long debate over the introduction as evidence of a letter by REA pertaining to one of the loan contracts.

Legal participants are already guessing that the arguments will take three weeks or more, and these two developments indicate much time may be consumed in side issues.

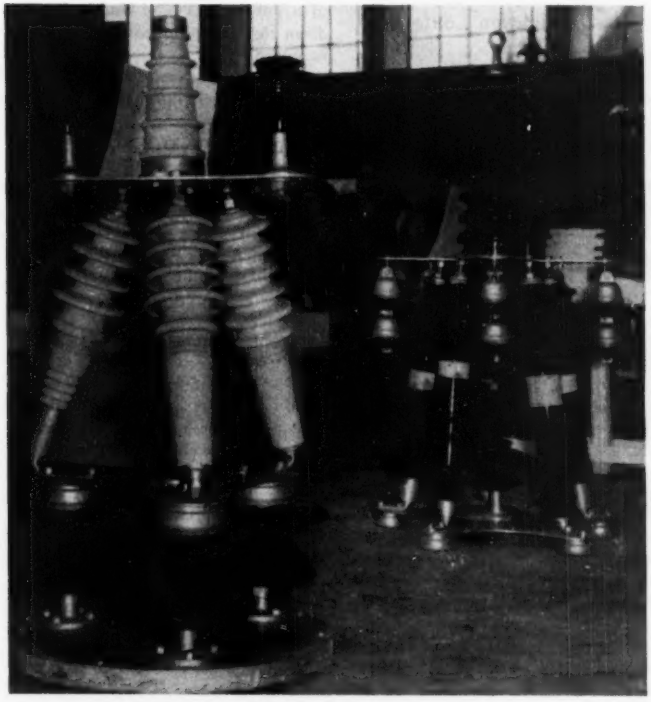
Main issue is whether REA and Southwestern Power Administration, an agency of Interior, have exceeded their legal authority in entering specified contracts with the co-ops. These contracts provide for REA loans to the "G & T" co-ops for construction of facilities which, in turn, are to be leased to SPA.

Questions . . . Among the questions to be decided at the trial are these:

- Has the Rural Electrification Act been violated by extending service to customers already served by central station power? By serving non-co-op members? By serving customers outside rural areas? By indirectly making loans to other government agencies?
- Has the Flood Control Act been violated by indirectly transferring funds from another government agency such as REA to SPA? Has or will SPA acquire transmission lines through other means than a Congressional appropriation? Has or will SPA acquire generating facilities in this same manner? Are the statutes authorizing SPA to purchase electric power and energy constitutional?

Parties Involved . . . Cooperatives involved are Central Electric Power, NW Electric Power, Show-Me Power Corp, Kamo Electric Power, and M&A Electric Power.

Companies bringing suit are Kansas City Power & Light, St. Joseph Light & Power, Missouri Power & Light, Missouri Public Service, Missouri Gas & Electric Service, Union Electric, Missouri Utilities, Missouri Edison, Empire District, and Arkansas-Missouri Power.



Red China Displays Electric Wares

Heavy electrical equipment was prominent among the items displayed by Communist China at the recent Liepzig Fair in the Soviet zone of China. The above apparatus exhibited by the Chinese Reds is a multiple tower-insulator with a dry flashover point of 210 kv. The largest item displayed was a 20-ton oil filled transformer rated 4,200 kva.

'Power Socialism' Charge Decried by Sparkman

Sen John Sparkman, Democratic candidate for vice president, warned Wyoming farmers and ranch men last week they "didn't stand a chance" of getting any more cheap electricity if they believed the "power lobby" charge that the whole reclamation program is socialism.

He spoke in Greybull, in northern Wyoming's Big Horn basin country, where reclamation was pioneered.

"The power lobby," he said, "has the notion that when the people's rivers are developed, some private utility ought to stand guard at the power house to control the power and collect its toll."

Development of the resources of the West, Sparkman said, had to be done by the federal government because individual communities could not develop them fully by themselves.

ALUMINUM PANEL at conference included: L. R. Hugon, Central Power & Light Co; Bryce Brady, Oklahoma Gas & Electric Co; R. W. Sherwood, Gulf States Utilities Co; E. S. Coleman, Dallas Power & Light Co; and G. R. Coffman, Texas Power & Light Co

What Are the Bosses Making?

That, says Texas dean at Power Distribution Conference, is what the young, scarce engineers want to know

How much are the bosses making? That, said W. R. Woolrich, dean of engineering at the University of Texas, is what young engineers want to know today when considering employment with any organization.

Dean Woolrich addressed the Power Distribution Conference sponsored each year by the university at Austin Oct. 6th. He said that in the utility field especially, engineers with five to 25 years experience have not received financial recognition in keeping with their qualifications and the times.

There is a tendency for young engineers to go into unions, said Woolrich, so they can make their demands felt as a group. He said it is up to those in administrative positions to see that these men are recognized on an individual basis.

Aluminum Problems Discussed . . . Present trend toward the use of aluminum for distribution circuits stems from the belief that the ratio of copper supply to demand is decreasing and the ratio of aluminum supply to demand is increasing, said M. E. Noyes, Aluminum Co of America. Noyes said considerations of price and availability will force aluminum into many new applications.

One problem that has developed, he said, is that of stringing aluminum and copper on the same poles. This involves careful consideration of differences in sags of the two types of conductors.

Work 13-Kv Lines Hot . . . Rubber gloves, hoses, blankets and hot-stick tools permit maintenance work on energized 13-kv lines, reported L. H. Cardwell of Dallas Power & Light Co. This practice has been made workable by design changes to improve working space and developing accessories suitable for hot stick installation and removal. Hot replacement of line fuses has been provided by use of disconnect switches one span ahead.

Studies Voltage Unbalance . . . Joint study by distribution engineers and equipment manufacturers of the acceptable limits of voltage imbalance for three-phase motors was advocated by A. S. Anderson, Ebasco Services, Inc. The four-wire delta 120/240 volt secondary is the preferred method of supplying light and power in residential and light commercial areas, he said. With unbalanced loading, unbalanced voltages should be expected. Establishment of proper working limits for appliances and secondary systems should reflect economy to the user, he said.

Extensive troubles with voltage imbalance on air conditioning installations were reported, frequently resulting in motors burning out.

Pressure and contact area, said Noyes, are the keys to good aluminum connections.

"If contact area is adequate; if pressure is high and permanent; and if moisture is genuinely and completely and permanently excluded, you have a permanent connection regardless of the metals involved," he declared.

It may be impractical to meet all these conditions, he said, but the better they are met the better will be the results.

Contrary to general belief, the oxide film does not build up on aluminum instantaneously but requires several hours, and under dry air conditions several days, to become a really high-resistant film, according to Julian Rogoff, Burndy Engineering. Pressures of 8,000 to 10,000 psi tend to break down the film on uncoated surfaces, he added.

Speaking of compression sleeves, H. P. Dupre, Burnby, said that strength of the connection increases with pressure up to the point where slippage is eliminated, then decreases as more pressure causes greater deformation. Thus, the proper zone for compression joints on aluminum conductors is in the high-strength region immediately beyond the slip limit, he said.

Maximum utilization of the kilowatt capability of long distribution feeders by the Texas Electric Service Co was reviewed by B. M. Gallaher. Fixed voltage boosters have been used infrequently, he said, and shunt capacitors have been found more desirable. They improve circuit voltage, reduce distribution current, release generating capacity, and increase emergency capability of the system. Although it is most advantageous to locate the capacitors on distribution feeders, transmission conditions indicate the total capacity to be installed in each distribution area. Light load conditions, he said, determine where capacitor switching is required. Approximately 50% of the company's installations are switched, mostly with time clock control to avoid "hunting".

Corrosion Plagues Industrials . . . Electrical equipment can be protected against corrosion in a number of ways, according to J. D. Moriaty, Gulf Oil

Corp. These include: Sealing against corrosive gases and moisture; providing clean dry atmosphere; controlling conditions causing moisture; using corrosion resistant materials; and treating with protective coatings.

Methods his company has used successfully are: Immersion in a good grade of transformer oil to seal against gases; strip heaters in equipment operated intermittently to prevent condensation; air conditioning to provide clean air; pressurizing the system with clean air; use of 18/8 stainless steel for guys and hardware; and application of polyethylene tape to conduit to prevent corrosion in an aluminum chloride plant.

'Plan for Harder Selling' . . .

. . . members are told at annual meeting of International Association of Electric Leagues in Minneapolis

Need for the electrical industry to adjust itself to the coming period of harder selling was the prime consideration at the 17th annual conference of the International Association of Electrical Leagues held in Minneapolis this month.

This theme was sounded at a first-day session by James T. Coatsworth, commercial director of Edison Electric Institute, who warned:

"Days will come inevitably when selling will get tougher and we will need to use every conceivable method in accomplishing the [selling] job."

He was preceded by two speakers who offered suggestions on how to do it.

Speaking on "Better Merchandising to Create Consumer Demand," C. J. Coward, merchandising manager of the Nash Kelvinator Corp, listed three ways in which sales resistance can be overcome:

- By training dealers to sell specific products they're handling, and not merely in how to sell.
- By making certain that salesmen make use of sales gimmicks provided by manufacturers, which heretofore largely have been ignored.
- By counselling dealers in maintaining the integrity of their operations, stressing that the customer is more important than the amount of money he has to spend.

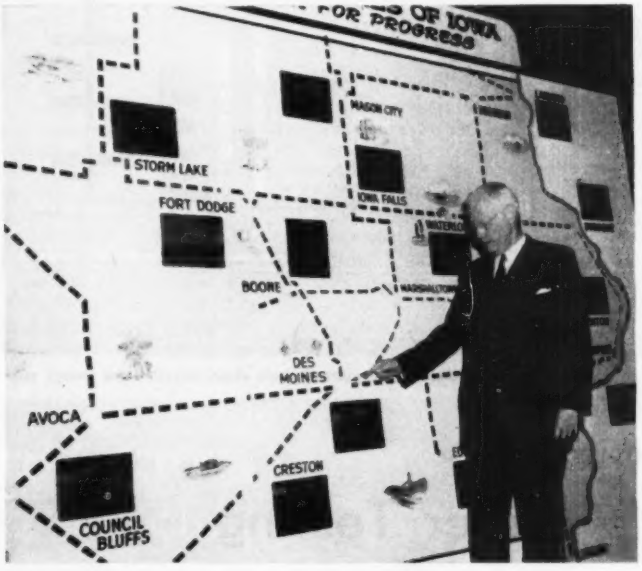
Utility Support . . . Backing up Coward, Carl T. Bremicker, vice president in charge of sales for Northern States Power Co, outlined the role of the utilities in aggressive selling campaigns.

"I think the day is long past," he said, "when a utility should hope for the best results in its promotion efforts unless it does discuss its program with interested branches of the industry and develop cooperative support."

Components of such a campaign, he said, are:

1. Clear enunciation of objectives.
2. Good timing, to take advantage of seasonal conditions and of national promotions and merchandising programs of manufacturers.
3. A broad participation base.
4. Cooperative financing.
5. Good will among the groups involved in the promotion.

New Officers . . . New president of the association is R. B. Hubbard, Rocky Mountain Electrical League. Other officers: Albert L. Maillard, Electric League of Indianapolis, vice president; E. J. McGinnis, Cincinnati Electric Association, treasurer; and Herbert E. Cook, Electrical Association of Detroit, secretary.



Planning for Electric Grid in Iowa

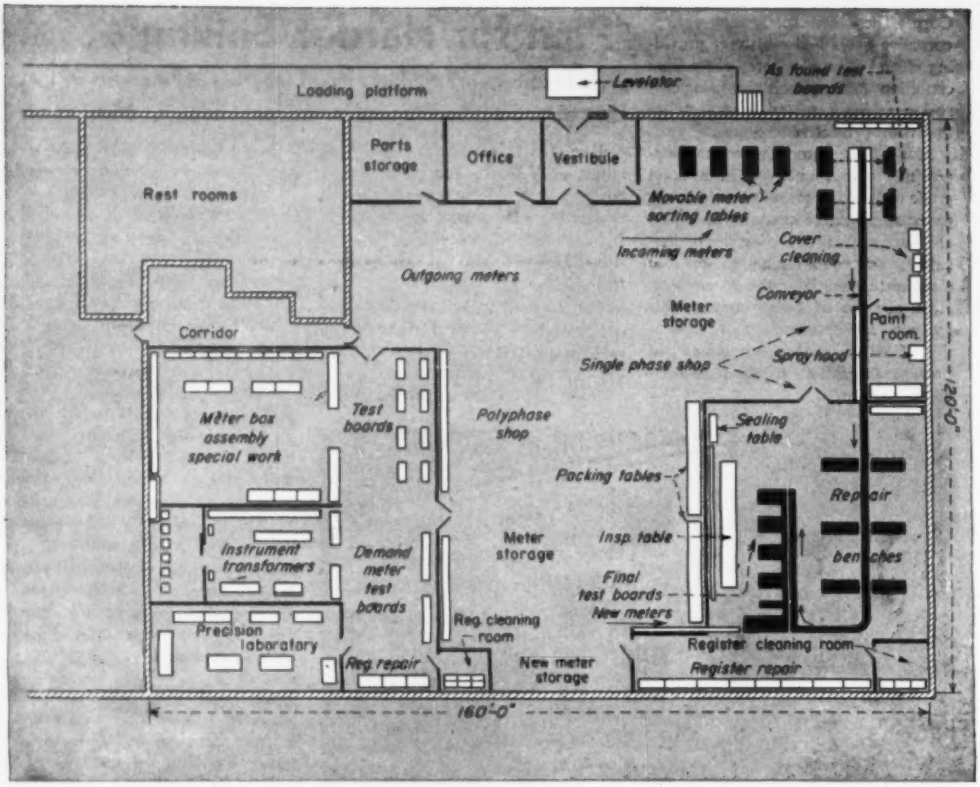
Plans for an electric grid system in Iowa are nearing the contract stage, it was disclosed at a recent panel discussion at the management conference of the Iowa Utilities Association at Des Moines. Above, a chart of the proposed network is studied by Sutherland C. Dows, president of Iowa Electric Power & Light Co.

Under the interconnection plan, all reserve capacity of eight participating companies would be available to all the members and all lines of the circuit would be operated in parallel.

The circuit would be operated by a company organized for the purpose and headed by representatives of the participating companies. Each company would follow its own construction plans, and electricity would be exchanged at prices dependent upon the operating cost and capacity of each company.

G. A. Neal, president of Iowa Public Service Co, said the network would be a means of "holding the line on rates," while Dows pointed out the lines would be available for the "wheeling" of Missouri River hydroelectric power "when and if" it becomes available to Iowa.

Cost of transmission lines and substations for the grid is estimated at $45 million.



ROLLER CONVEYORS move meters from point to point in new meter shop which consists of single phase, polyphase and storage sections

New Meter Shop Designed For . . .

Assembly-line Meter Testing

80 meters per man per day are tested with automatic equipment. Roller conveyor moves meters from point to point with maximum speed and minimum effort

L. P. GROVER
Meter Engineer, Public Service Co of Indiana, Plainfield, Ind.

Assembly line methods have been adapted to meter handling, testing, and repairing at Public Service Co of Indiana's central meter shop which is part of a new general headquarters. Occupying approximately 19,000 sq ft, the shop is fully equipped with a roller conveyor for moving meters and automatic test facilities where each operator is actually checking in excess of 160 new meters per day. Meters calibrated or adjusted will run better than 80 per day per man.

Basically, the 19,000 sq ft is divided into three major sections: single phase, polyphase, and storage. The storage section is located between the single phase and polyphase. Final layout was influenced by a visit, prompted by story in July 17, 1948 (p 66) Electrical World, to Pennsylvania Power & Light Co's meter shop.

Approximately 95% of the total number of meters on the Public Service system are single phase, less than 50 amp capacity. The shop was therefore set up with a view to top production, 300 meters per day, through use of special equipment and methods so that man-power would not be pushed beyond reasonable limits. There are more than 320,000 meters on the system.

Meters and metering equipment received from the field for test and reconditioning are unloaded from company-owned, van-type trailer trucks and stored in proper location for processing. All meters are trans-

ported from the field, and back to the field, in cartons, eliminating the need for meter racks.

Single Phase Section . . . Single phase meters received from the field are removed from meter cartons and separated into groups of like kind prior to the "as found test", so as to eliminate frequent changes of test control switches on the automatic test boards. They are moved to the preparation table for unsealing, preliminary cleaning, and the replacement of soiled covers. They then go across the preparation table, directly back of the "as found" tester.

The completely automatic photoelectric meter calibration boards in the single phase section perform the full load, light load and 50% power factor tests automatically and in sequence. Each of the three tests is recorded by a separate standard. Each unit contains three standards. Six of these test boards, in two groups of three each, are set up at the start of the production line for "as found" tests. An operator at each group of three boards will turn out at least 160 "as found" tests per eight hour day.

After this test the meter is placed on the roller-type conveyor. This 105-ft section is the longest of four. Meters then travel by gravity into the paint shop where those that need painting or touch up are removed from the conveyor, and the rest continue into repair and final calibration room.

Major and minor repairs are performed on work benches, located on each side of the conveyor, with an adequate stock of repair parts close at hand. Repaired meters are placed on the conveyor and moved to the final "Hi-Pot" table where both new and used meters receive an insulation test. New meters arrive at this same "Hi-Pot" table from the opposite direction via another section of roller conveyor (35 ft long). This conveyor starts in the storage section where new meters are unpacked and Meter Life Record Cards are attached to each of the meters.

From the "Hi-Pot" test, both new and reconditioned meters reach the final calibration boards via a wood slide board conveyor which runs along the right side of final calibration boards. Feeder sections are joined into the main slide trough to provide an additional supply of meters directly behind the operator.

Twelve of these automatic test boards for making final calibrations and checking new meters are set up in four groups of three each, with one operator for each group.

On the inspection table each meter is inspected for correct register ratio, proper moving element clearance, general appearance, both internal and external, and closing of the test link. The meter then goes on a third section of the conveyor (35 ft long) to the sealing table, and thence to a fourth section of conveyor (35 ft long) which takes meters to packing area.

A special room in the single phase repair and test section, with adequate ventilation, is used in conjunction with L&R cleaning machines, for cleaning registers and small parts such as jewels and pivots.

Polyphase Section . . . Volume of work is relatively small in the polyphase section. However a good arrangement and adequate space were provided. A new precision test board for the laboratory is used for calibrating test standards. Good accuracy is attained through the use of uniload current and potential transformers.

New polyphase test boards are to be built to replace older boards brought in from the field. These are to be desk high and will be semi-automatic with push button control.

A work shop in the polyphase section provides for any special work and in addition will be used for the assembling and wiring of meter and instrument transformer enclosures to be used in the field.

MOVING ALONG from the paint shop (beyond wall) meters undergo major and minor repairs, insulation tests, and final calibration at stations along the conveyor. First stop (see front cover) is "as found" test, where photoelectric calibration boards test full load, light load

Sell. . . and Sell. . . and Sell

CHARLES E. OAKES, President
Pennsylvania Power & Light Co., Allentown, Pa.

Today's Challenge to Our Industry . . . Sell, or Else

Confidence of one utility to meet the challenge is rooted in experience with comprehensively planned sales activities, aggressively carried out

A great challenge faces American business. It is the challenge to sell. It is not new. Response to it through the years of our history has built up on the foundation of free enterprise a fabric of social justice and industrial strength the like of which never existed before. As said, the challenge to sell is nothing new. But it now has greater insistence, and its urgency will increase.

Our institutions and our way of life are menaced by a hostile philosophy that has been imposed on a large proportion of the world's population. That philosophy has infiltrated the minds of our people to some degree.

Today, when the strength of our country is the first deterrent to aggressive action aiming to communize the world, a heavy responsibility lies on business leadership. It is to maintain, to increase, our strength.

Discharge of that responsibility means selling. This is the challenge—to sell, to sell not only goods and services, but also understanding of, and faith in, the principles of free enterprise and free opportunity for all.

In the years before World War II business was almost entirely concerned with selling things, put little or no effort into selling the principles on which its existence depends. There seemed no need to do so. But now the need is plain.

Business must sell itself as well as what it produces.

This is particularly true in respect to the electric power companies. No other business has suffered so much from the socialistic infection in the minds of our people. No other business needs so much the understanding and faith of all the people. That understanding, that faith, are the aims of our company in all of its operations.

We believe sincerely that aggressive marketing of our services contributes much to the prosperity of our service area. In turn, the better economic tone builds new and larger markets for our services. As sales increase, each additional kilowatt hour sold acts to dilute the proportions of the fixed elements of cost in the unit price. Therefore the more kilowatt hours sold, the greater the benefit to all customers. And the more rapid rate at which more kilowatt-hours are sold, the sooner all customers benefit.

Got an Early Start

Immediately following the late war, Pennsylvania Power & Light instituted a reconversion and peace-time sales program. It was designed to further our aims of understanding and faith among our customers and to make the greatest possible contribution to increased company earnings which were necessary for sound financing of the extensive system expansion we had planned.

This sales program, enlarged, refined, and made more

productive by the lessons of several years of experience, is our program today. It is our program for the future. We are confident it will meet successfully any economic change resulting from levelling off of defense spending in the coming years. The program has proved itself in results. We are sure it will continue to do so.

The sales program aims at three primary objectives—

1. Obtaining compensatory revenues.
2. Stimulating and promoting good customer relations.
3. Bringing about a better understanding by the public of the American free competitive enterprise system.

These objectives are being attained by means of a "sales creed" which says that the company and its representatives will recommend no new or additional use of its service until conclusively satisfied that the customer will benefit in increased production or profits, or in improved standard of living.

Company Spearheads Promotion

Beyond this there is the principle that as long as the market potential for appliances and equipment is met by manufacturers, distributors, and dealers, the company will confine its promotional marketing efforts to creating interest and desire in the minds of customers and to persuading them to buy.

The sales department has two annual budgets:

1. Sales Budget. This is estimated on the basis of past experience, on continuing local market studies, and on economic forecasts, both national and local. Involved in the estimate is assumption of active and positive cooperation of electrical equipment and appliance manufacturers, distributors, and dealers, plus the work of an adequate and trained company sales organization.

2. Expense Budget. This is estimated on the basis of current successful promotional programs, on new programs that have had "trial runs" and thus have demonstrated value, on anticipated degree of sales ally cooperation, and on the anticipated needs of a well-selected and trained sales organization for sales tools to achieve projected objectives against contemplated competition and buying inertia.

Many factors are considered in developing the company's sales promotion methods. The population of the service area has not been subject to wide fluctuations. Thus, there is less variation in numbers of farms, homes, stores, and industrial establishments than in less well-established areas. Our sales programs must be largely designed to get business from those who are "here" rather than those who are "coming here."

Must Intensify Sales Effort

Sales planning for 1953 is already well under way. We see a re-awakening nationally of the need for more creative selling to keep the distribution channels flowing with goods and services. Production is no longer the major problem. Distribution—creative and aggressive selling to increase consumption of goods and services—needs much of the attention heretofore given to production.

This means, for us, an intensification of our activities based on established sales principles and methods.

We anticipate no substantial or basic change in our sales organization.

Our sales staff is organized on a three-function basis and has been developed to accomplish our objectives effectively and efficiently. The functional bases are:

1. Planning and Programming. The establishment of sales plans, programs, policies and principles for the entire sales organization is the responsibility of the headquarters organization.

2. Sales Performance. Execution of the sales plans and programs in accordance with the established principles and methods is the responsibility of the field organization.

3. Economic Development. This is the primary responsibility of a full-time area development group in the general sales department. But it is also a cooperative responsibility of every member of the sales organization as well as every employee of the company in cooperation with community leaders throughout the service area.

Since we do no extensive merchandising (almost all merchandising being confined to sales to employees), practically every sales activity is based on sales ally cooperation for its success.

At least one meeting is held each year with these sales allies in each of the manufacturer, distributor, and dealer classifications, for a look ahead at mutual sales problems. In addition, constant contacts are maintained throughout the year with all sales allies (manufacturers, distributors, retailers, architects, builders, contractors, engineering consultants, realtors, educators, bankers, oculists, optometrists, etc) to gain their full understanding, endorsement, or active support of sales activities for their own and company benefit.

Use All Sales Tools

Specific programs are designed to coordinate the efforts of all sales allies with those of the company. These activities are well supported by such standard sales assistances as newspaper advertising, billboards, store window and sales floor displays, selective distribution of promotional literature, and direct specialized sales assistance.

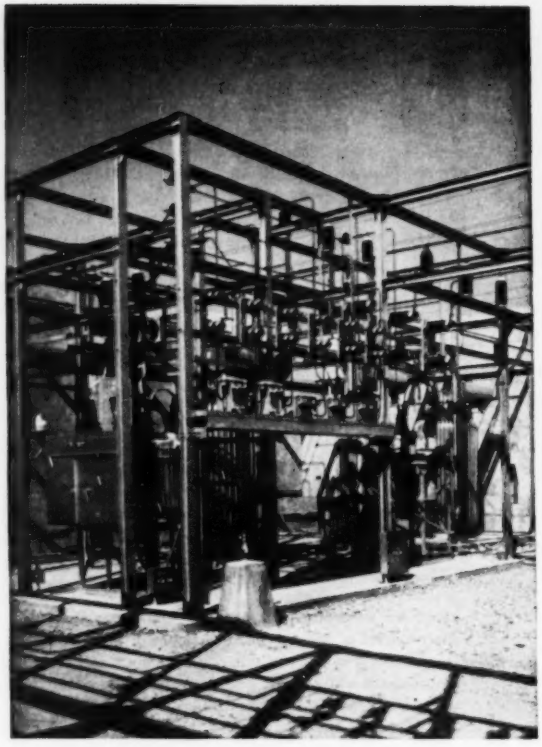
Printed programs for 1950, 1951, and 1952 outlining objectives and cooperative planning in each market in detail have been produced, distributed, and explained through widely attended meetings.

There has been little need for us to consider the load characteristics of individual appliances in planning our sales promotion activities. The degree of sales promotion effort in any direction is controlled almost entirely by the following criteria:

1. Value of the appliance, equipment, or service to the customer.
2. The amount of annual revenue produced.
3. The market potential—immediate and long-range possibilities.
4. The present customer acceptance indicated by customer saturation.
5. Availability of the product in terms of both time and amount.

Since 1946, sales increases have been attained which amply justify the sales programs and their costs. We believe that substantial contributions to strengthening the local economy have been made by our sales activity. These have resulted in making the company's service area known as among the most favorable in the nation in which to live and do business.

We believe, too, that any realistic appraisal of our sales and related efforts would show enhancement of customer appreciation of electric power, improvement in public relations on both a company and industry basis, and, we hope, greater public understanding of, and faith in, our American system of free enterprise.



Modern Roofless Exterior Encloses 30,000-Kva Substation

Precast concrete panels comply with City Planning architectural requirements, permit use of conventional outdoor rack-type equipment for economical construction and maintenance. Rolling steel doors pass trucks or mobile cranes. Saving 40% on cost, 52% in time

We Cut Our Substation Building Time

New construction technique saves Los Angeles Department of Water and Power time and money for distribution substation enclosure that meets City Planning Commission requirements

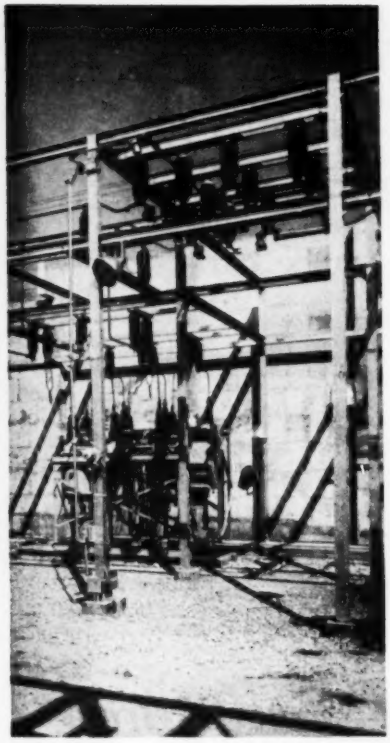
J. W. ERVEN, Engineer of Distribution Station Design, Los Angeles Department of Water and Power

Wall panels that were precast on the site and lifted into place, and use of outdoor electrical equipment combined to save the Los Angeles Department of Water and Power 40% in costs and 52% in construction time on a new 30,000-kva distribution substation.

Exterior design of the station was dictated by architectural requirements of the City Planning Commission that distributing stations in most commercial and residential districts of Los Angeles must be housed in buildings. Rising cost of such buildings spurred the department to examine construction methods. Studies showed that a design based on precast panel walls and rack-type outdoor equipment would meet the requirements and provide a structure low in cost and pleasing in appearance.

Modern Appearance . . . Outwardly the station appears to be a modern, single-story building. A small control house 24 ft by 41 ft adjoins the building wall and looks like a continuation of the structure. Only the control house is roofed, but all projections above the main wall lines are provided with short wing walls to give the illusion of a roof. Access to the station is through the control house or either of the two 16 ft wide by 20 ft high rolling steel doors, located in opposite ends of the equipment area. When fully open, these doors permit passage of mobile cranes and loaded transformer trucks.

Electrically the station is of the conventional outdoor rack type with open buses and outdoor equipment. It has an ultimate designed transformer capacity of 30,000 kva, fed by three 34.5-kv lines entering the station



Use of outdoor equipment made it unnecessary to roof the building, saving construction costs and eliminating ventilation problems. One additional advantage of using an unroofed building was the large work area and unlimited head room available for mobile cranes in placing rack components and units of equipment inside the large enclosure.

Precast Design . . . Precast portion of the station consists of 29 wall panels, each approximately 8 ft wide by 18 ft 4 in. high. First panels were poured on a temporary casting platform. After curing, additional panels were poured over these first ones, using a special liquid coating between panels for parting. This procedure was repeated until four or five panels had been poured in each of six stacks. Panel reinforcing consisted of No. 3 bars spaced 9 in. center-to-center both ways.

Eight inserts cast in each panel provided a means of securing the lifting gear. This gear was designed for lifting at the center of gravity when breaking the panels away from the stacks. After parting, the lift yoke was allowed to move freely and the panel was lifted into place on the wall grade beams. The panels were shored in position and forms were constructed at the points of junction for the casting-in-place of the wall columns. Wall pieces carried around the racks provide points of attachment to each wall column; so rack and precast wall function as a unit. By using a mobile crane for placing the precast panels in position, all 29 panels were erected and fastened in place in four working days.

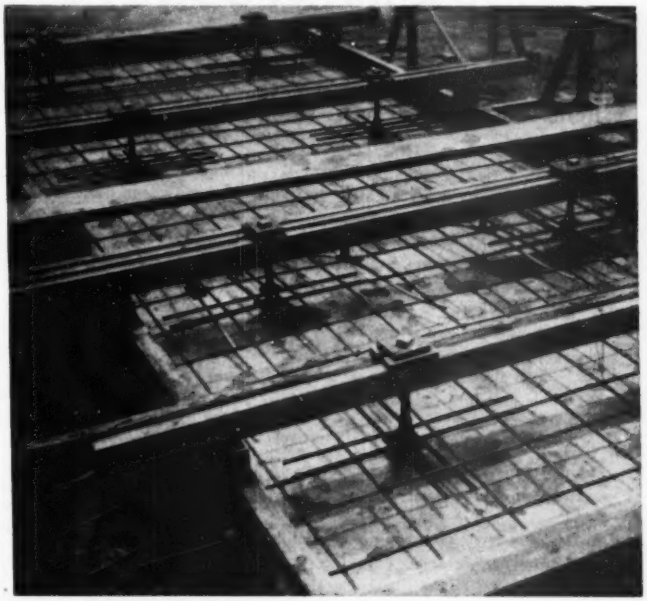
To Build Two More . . . As a result of the experience obtained from this type of construction, the department is now building two additional stations of this type. Three other stations are being designed to use precast panel construction. As a further simplification, the racks and walls of these new stations will be designed as individual units, with no points of connection provided between the racks and wall columns.

This modification will result in further economies in labor and in construction time as well as making the substation structure more flexible.

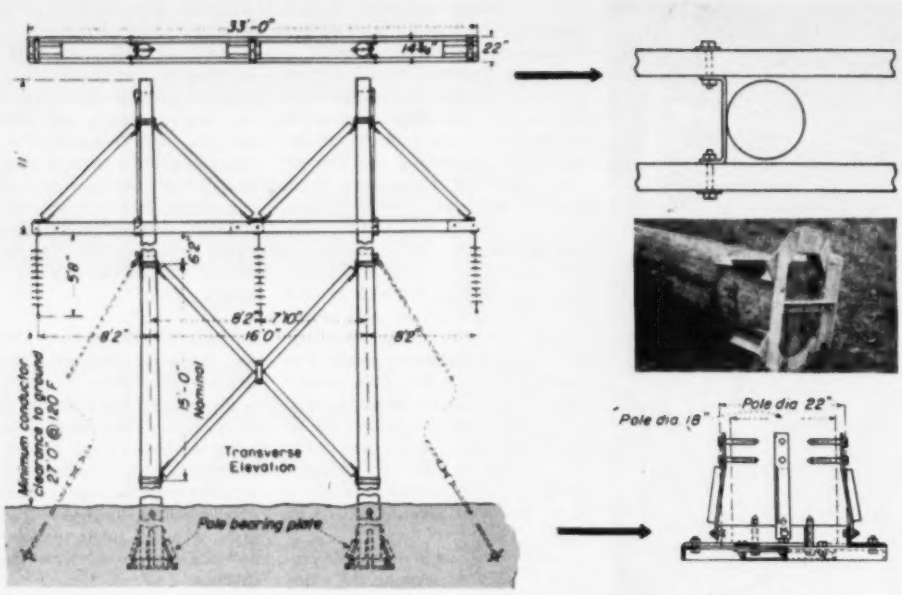
In Two

through underground gas-filled cables. The station is designed for 16 4.8-kv individually regulated, automatic-reclosing feeders. It will be supervisory-controlled from a receiving station approximately 3½ miles distant. The 4.8 and 34.5 kv racks are installed in an area 124 by 96 ft, with a working space 17 ft wide between them. Racks and equipment are completely hidden from view by the surrounding 21-ft walls.

The department decided to use conventional outdoor units and to equip only the number of feeder positions required for serving the initial load in order to hold down initial outlay for electrical equipment. Because many outdoor rack-type stations are used in outlying areas, the department maintains a warehouse stock of outdoor feeder equipment; so additional feeders can be equipped on short notice.



READY FOR POURING, panel "stack" includes steel reinforcing bars spaced on 9-in. centers and eight inserts for securing lifting gear. Parting compound separates panels as they are poured one on top of another. Lifting and placing panels takes little time with mobile cranes; yoke lifts at center of gravity until panel breaks away. Wall columns are formed, poured with panels in place. Two more substations are being built this way; three more are planned



DOUBLE CROSSARMS have two spacer plates for pole attachment with minimum labor in the field. Inset drawing, (upper right), shows detail of spacer plate construction. Bearing plate detail, (lower right), shows how bearing area for poles is increased 100%

132-kv Wood H-Frame Structures

Wood-pole construction, chosen for economic as well as material considerations, offers these significant features:

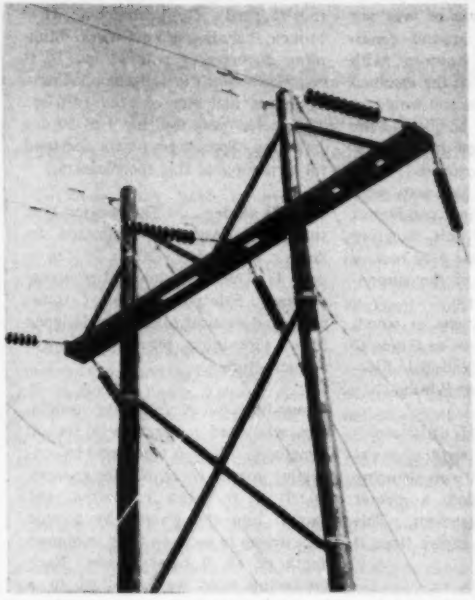
- **Wood-pole structures are built to follow steel tower specifications for strength and reliability.**
- **Suspension structures are designed to withstand stress due to one broken conductor without mishap.**
- **Two-pole dead-end structure is used instead of usual three-pole construction, at considerable saving.**
- **Double crossarm design includes spacer plate for attachment to poles in the field.**
- **Crossarm design eliminates tailoring on poles at structure site. Adjustments are easily made.**
- **Assembly labor costs are greatly reduced on the structure site because all drilling is pre-done.**
- **Pole bearing plates increase resistance to uplift by 100%, making structure stronger.**

LESLIE W. TOYE, Engineer, Electric Distribution Dept, Public Service Electric & Gas Co, Newark, N. J.

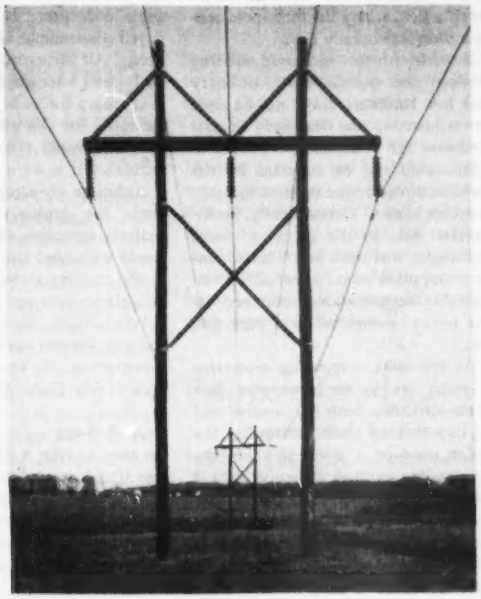
Early in 1950, plans were formulated for the design and construction of a 132-kv, wood-pole, H-frame, single-circuit line from Trenton (N. J.) Switching Station to the nearby U. S. Naval Air Turbine Test Station. Wood construction was chosen primarily for economy reasons. But another factor was the fact that restrictions on steel for high-tension transmission were beginning to be felt.

The line is approximately nine miles long and has 91 wood-pole structures and 7 steel towers. The terrain is mostly flat farm country, but the line traverses a swamp area for two miles.

Conductors . . . The conductors are 397,500-circ mil ACSR, 30/7 stranding. Basic tension at ½-in. radial ice and 8-lb wind at 0 F is 5,000 lb. Two overhead ground wires of 134,600-circ mil ACSR, 12/7 stranding, were



DEAD-END STRUCTURE Type D 60 is designed to withstand deflection angles from 20 to 60 deg in the line



SUSPENSION STRUCTURE Type A is in general use on the line, is designed for tangent conductors with zero angle deflection

Based on Steel Tower Design

installed. Basic tension is 3,660 lb corresponding to the conductor loading. Shielding of the ground wires provides a 26-deg angle protection for the conductors at the structure on the suspension-type structures, and a 40-deg angle protection at the structure on the dead-end types.

Design Features . . . The structures were designed for little or no tailoring at the structure site, in order to keep labor costs at a minimum. All holes in crossarms and poles and any gaining to be done were to be completed before treatment and shipment. The poles and framing were to be assembled without shaving or cutting of any kind. Actually, however, during the pole-setting period, some poles settled because of wet ground conditions, necessitating reboring holes in a few poles to level the crossarms. All such holes were field treated with preservative material. All knee and X-bracing connections to poles were accomplished by the use of pole bands as holes for these connections would be difficult to locate prior to construction.

A high factor of safety was maintained for each type of structure, and aside from wood being subject to mechanical injury and fire, the expected longevity and reliability of the line are comparable to steel tower construction.

Nine 5¾-in. insulator disks were provided on the suspension structures, eleven 5¾-in. units on dead ends. Minimum clearance of the conductor to wood members is 42 in. and the minimum clearance of the conductors from the pole grounding wire is 48 in. Normal clearance of conductor to wood or steel is 54 in. These clearances closely approximate those of steel tower configuration for 132-kv operation.

The insulator swing computations were based on no ice, 8-lb wind at 0 F. Maximum allowable insulation string displacement is 45 deg from the vertical on the A type structure, 55 deg on the B type, and 60 deg on the C type structure. Conductor displacement out in the span is 41 deg under the above loading conditions.

Crossarm Design . . . Double crossarm construction was used for all types of wood structures. Length of crossarms on the A-structure was 33 ft, which provided a conductor separation of 16 ft. On all types the crossarm timber was 4 x 10 in. in cross-section; the double arms on the suspension types being separated by three wood blocks, one at each end of the arm and one at the center location.

Separation between the two planks of the crossarm was maintained at a fixed distance and was the same for all types of structures. By following such a procedure, no alteration to the poles (which varied considerably in size) was necessary. Because of the wide separation of timbers in the double arms a high internal resistance to withstand the design loads was established. This condition, and the use of Class 1 poles throughout the line, permitted the use of the two-pole H-

frame structure for deadend angle construction, where the three-pole configuration is generally used.

Because of the increased spacing between the double arms, ordinary pole line hardware could not be used for connecting the timbers. Special hardware for connecting crossarm to poles could not be supplied by the manufacturer in time to meet the construction date. Consequently, commercial steel in the form of plates and angles was used and a local concern supplied the material. Considerable economy was obtained by this policy, compared to a packaged job.

As the bolts connecting crossarms to poles are in the transverse face of the structure, both the positive and the hypothetical loads assumed in the design produce a moment about the pole tending to crush the wood around the bolt area. This condition was avoided by the use of timber connectors in the form of shear plates at these bolt locations, to increase the bearing area of the wood. The creosoted pine poles were in a green state at the time of construction and the use of the timber connectors was considered to be essential.

Structure Design . . . Poles 65, 70 and 80 ft long were specified and installed. Final mid-span clearance of conductors to ground was 27 ft at 120 F, using a normal span of 500 ft throughout the line. Each structure was equipped with knee bracing and one set of X-bracing to withstand the transverse loads.

Pole bearing plates were designed locally and installed on every pole. Use of these bearing plates was a precautionary measure primarily against an unusually high wind normal to the line which might occur before the soil was consolidated around the pole area. The bearing plates increased the bearing area 100% in resisting both compression and uplift loads.

A right-of-way with a width of 100 ft was acquired for this line. This allowed ample clearance to the edge of the right of way for the voltage concerned. Out of a total of 91 wood structures, 37 were guyed. The guyed structures included some type A and all type B, C and D structures as required by specific sites.

Type A Tangent . . . This type of structure was used in general throughout the line. It was designed for no angle deflection. It was or was not guyed depending on ground conditions. All structures, however, with 80-ft poles were guyed as the assumed reactionary forces in the soil would be increased for this pole height and the structure would fail first from lateral instability if it were unguyed.

Although no actual field tests were made for broken wire conditions, analysis indicates that this structure would withstand any one wire broken at the holding power of the suspension clamp plus impact.

Wind loads, fiber stress in wood, and guy stresses conform to Grade C construction of the National Electrical Safety Code, Fifth Edition.

Type B 5-deg . . . This structure is the same as type A in specification except that it is equipped with swinging brackets to accommodate a greater insulator string displacement. This type allows deflection angles from 0 to 5 deg in the line.

Type C 15-deg . . . Specification for this type structure is the same as for types A and B except that the swinging bracket plate is reversed on the middle phase in order to give the required conductor clearance to pole under severe wind conditions. For clearance reasons also, the crossarm is unsymmetrical about the center line of the structure. This type allows deflection angles from 5 to 15 deg in the line.

Type D 20-deg . . . This tension type structure is designed for use from 0 to 20 deg deflection in the line, and fulfills three specification requirements as follows:

1. For standard line construction only. Safety Code Grade C, transverse and vertical loads were designed for all wires intact, plus wind on wires and structure. Minimum diameter of pole was 13 in., 16 ft below pole top, for 0 to 20 deg deflection.

2. For railroad use only. Construction is Safety Code Grade B and the structure is designed for any two wires broken, including ground wires. Minimum diameter of pole was 13 in., 16 ft below pole top, for 0 to 10 deg deflection. Minimum diameter of pole 14¾ in., 16 ft below pole top, for 10 to 20 deg deflection. Special guys were used at locations where angles in the line are greater than 5 deg to increase the support.

3. For terminal construction only (not railroad). Designed for all wires broken, including ground wires. Minimum diameter of pole 13 in., 16 ft below pole top, for tangent condition. Minimum diameter of pole 14¾-in., 16 ft below pole top, for 0 to 20 deg deflection. Special guys were also used for structures of this specification.

Type D 60-deg . . . This tension type structure is designed to withstand deflection angles from 20 to 60 deg in line. It is used for standard construction only. Safety Code Grade C transverse and vertical loads was designed for all wires intact, plus wind on wires and structure.

Grounding . . . A grounding installation was used in each pole for all structures. Fly taps were used in connecting ground wires to poles approximately 8 ft below crossarms, and carried into the ground by ground rods driven in sections for a minimum depth of 18 ft below grade. Each grounding wire was attached to a longitudinal or transverse guy, where guys were used. Overhead ground wires were strung with 1 ft less sag at mid-span than that of the conductors at 70 F in order to increase the lightning strength of the line.

Earth resistances were measured prior to conductor and ground wire installations for the entire line. After the survey of the line was completed, the grounding at each structure footing in the range of 25 ohms or less was accepted. Where high and low footing resistances were measured on adjacent ground rods of the same structure, a temporary cross tap was installed and the earth resistance was remeasured. By such a procedure the resulting resistance was found to be low enough to be accepted at many structure sites, and therefore a cross-counterpoise was buried at these locations.

In sections where ground resistances were above the optimum value required, an additional ground rod was driven on the center line of structures forming an equilateral triangle connected by counterpoise. At some locations additional counterpoise was installed on unguyed structures or connected to anchor rods on guyed structures. It is believed that these measures together with adequate shielding will be highly effective in keeping lightning tripouts to a minimum during line operation.

Few Outages for Overhauling

EEI Prime Movers Committee reports newer turbogenerators require less frequent checkups, resulting in big savings

Turbogenerators have in general progressed to the point where an outage for overhaul oftener than once in five or six years appears unjustified. Resulting savings of $3,000 to $10,000 per day and as much as $100,000 for each deferred overhaul were well substantiated in the consensus of discussion at the meeting of Edison Electric Institute's Prime Movers Committee in New Orleans, Oct. 6 and 7.

Improved metals, improved overall reliability of the units coupled with better records of the factors indicating deterioration were cited as the principal contributing factors. Many members felt that operators can "see" the conditions of large modern machines better than the "feel" they relied upon in connection with the older units.

Cost Compilations . . . Preliminary cost compilations on 33 stations reported by 22 companies showed structures costing from $8 to more than $50 per kw of guaranteed capability, boiler plant from $30 to $75, turbine house equipment $25 to $50, and overall outlay from $90 to more than $200.

Design and maintenance trends were indicated by several tallies taken of those present. Ten, for example, favor separate motor-driven exciters, four gear-driven shaft exciters, and three direct-drive shaft exciters. Feeling expressed was that 3,600 rpm is too high a speed and that reduction gears have not been wholly trouble-free. On semi-outdoor plants there was a preference for motor drives for soot-blowers rather than air in the ratio of 21 to 3.

Fifteen said their companies have used television for various purposes but only four installations are still reported in service. Further development is assured because the value of the tool is definitely recognized.

Virtually no one opens pumps for scheduled routine inspection; 27 prefer to wait for adverse performance or the results of test. Little preference was indicated for vertical over horizontal feedwater heaters; for the vertical, however, the water-box on top was favored.

Vibration Preferences . . . A majority of the committee thinks that a 1-mil vibration at the pedestal is a satisfactory maximum for either 1,800 or 3,600 rpm machines. At the shaft the vibration could be expected to be 2 to 6 times as much as at the pedestal. Parallel shafts for large tandem-compound units seem to be favored wherever low-grade fuel and large boilers are involved. Location and size of the control room were recognized as modifying factors for the turbine-hall arrangement.

Oxygen recorders were generally viewed as a "must" for plants burning coal or gas because of the quite different volumes of combustion gases. Considerable skepticism about pressurized furnaces was evinced despite the fairly large number of commitments in current plant designs. Two parts of dolomite for each part of ash is proving effective on the eastern seaboard in preventing slag formation when burning vanadium oil.

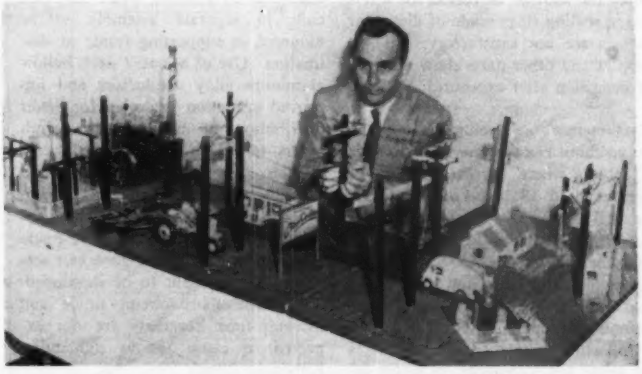
Shakeouts vs Dumpers . . . Discussion of motors driving vital auxiliaries and operating in hot locations evoked a 4 to 1 preference for Class A insulation rather than incur the extra outlay for Class B. Shakeouts were deemed satisfactory in cold climates where up to 25 cars per day are to be handled; beyond that a car dumper is viewed as more economical. In mild climate the shakeout is justifiable for heavier operation even for simultaneous dumping of two cars. Complaints from as far as two miles were reported on the noise aspect of shakeouts.

Pepco's Load . . .

. . . is discussed by Bisset at joint EEI-AEIC committee meeting in Washington, D. C.

The Pentagon, largest office building in the world, has a load of 31,000 kw and 31,000 employees, or about one kw per employee. This was one of the facts brought out by George Bisset, vice president in charge of operations, Potomac Electric Power Co, as he reviewed the load growth of his company.

Bisset spoke before a joint meeting of Edison Electric Institute's Meter and Service Committee and Association of Electric Illuminating Companies Committee on Metering and



Power Company System in Miniature

Miniature power company system built by Willie Biggs, Dunn district accountant for Carolina Power & Light Co, was put to good use at monthly meeting of District Operations employees. The steam plant burns alcohol and when the pressure gets right the street lights come on. Biggs added a few authentic touches to the scene with a "Finer Carolina" billboard and a Reddy Kilowatt emblem on the smokestack at the left.

Service Methods, Oct. 7 at Washington, D. C.

Customer Increase . . . Bringing the committee up to date on Pepco's operations since its last meeting in Washington in 1939, Bisset said his company now serves 300,000 customers, an increase of 150% over '39. Peak load on the system now occurs in August and this year amounted to 652,000 kw. Peak service to government agencies was 232,710 kw. Pepco has a capability of 723,000 kw.

The government is Pepco's biggest customer accounting for 32% of its load. Residential load is 17.23% of the total, with the remaining 50% divided among street lighting, railway, and commercial. Pepco has no industrial load.

Speaking of residential load, Bisset noted that each of the latest garden type apartment houses has individual requirements of between 3 and 4 million kwhr. He said a major load problem is the increased use of window type air-conditioning units which operate at low power factor.

On the subject of corrosion prevention and protective coatings, reported F. A. Salmon, Central Power & Light Co, two manufacturers have started tests on corrosion of meter registers of aluminum and corrosion resistant finishes for meters.

A California utility has determined among other findings that most paint finishes on die cast sockets merely delay the start of corrosion for a few years; sealing rings made of dissimilar metals are not satisfactory; Bakelite nipples and other parts show no signs of corrosion after exposure.

Cyclometers . . . Cyclometer registers on watthour meters were noted to have 27 points where friction develops as compared to 18 points on the clock or dial type registers, stated E. L. Keller, Duquesne Light Co. Customer cyclometer readings, if numbers are not sufficiently large and clear, have had more errors than readings where pointer positions are indicated.

In a study concerned with the effects of meter test tolerances on meter department costs, G. A. Palmer, New England Electric System, reported that when one company made tests with staged runs and increased the accuracy tolerance from ± 0.1 to $\pm 1.0\%$, it obtained 35% increase in output per man-day average for new and reconditioned units.

Less Noise from Substations

That and other engineering problems are discussed at meeting of PEA's Electric Equipment Committee

Close cooperation between manufacturers and utilities is needed to reduce substation noise, L. L. Nonemaker, Pennsylvania Power & Light Co, said this month at a meeting of the Electric Equipment Committee of Pennsylvania Electric Association at Dallas, Pa.

Maker and user, he said, should use greater skill in designing station and substation installations to minimize objectionable noises.

"The proper design," he commented, "should neither look nor sound like a substation."

Magnetostriction is believed to be the main cause of transformer noise, reported K. B. Munter, Allis Chalmers Manufacturing Co, although coil movement by magnetic forces may be a factor. Research on oriented steels offers possibility of reducing noise, he said. Working at lower flux density is also beneficial but costly with present material.

Larger Generators . . . Introduction of oil-cooled hollow conductors in generator stator windings raises the foreseeable limit for single-shaft turbogenerators over 360 Mva, according to C. E. Kilbourne, General Electric Co. Shipping limitations have been overcome by building stator core and coils in separate assembly to be mounted in supporting frame at destination. Use of oriented steel, hollow aluminum alloy conductors and improved insulation in design for better distribution of cooling gas permit rotors to match the new stator capacities.

Shaft mounted exciters, he said, become impractical for such large machines and a choice must be made between separate motor-generator sets or other equipment to be developed.

Reduced short circuit ratios and thermal time constants are not expected to cause serious difficulties, Kilbourne stated.

Some significant developments in station design were disclosed:

1. Automatic starting diesel-driven generator for emergency station service and battery charging.

2. An ac pilot exciter with permanent magnet field and selenium rectifier to supply main exciter field.

3. Consideration of starting current of large auxiliaries; one station used 2,800 amp at 4 kv for 8 sec.

4. Automatic transfer of auxiliaries from main to emergency service.

5. Flat steel strip for station ground grid to conserve copper; no ground rods needed to satisfy resistance limits.

6. Connection of new generating capacity to existing transmission systems designed to minimize interrupting duty on switchgear.

CALENDAR

National Farm Electrification Conference
Statler Hotel, Detroit, Mich., Oct. 19-21.

National Association of Suggestion Systems
10th Annual Convention, Drake Hotel, Chicago, Oct. 20-21.

National Electrical Industries Show
Sponsored by Eastern Electrical Wholesalers Association, 69th Regiment Armory, New York, Oct. 21-24.

Pennsylvania Electric Association
Industrial Committee, Bedford Springs Hotel, Bedford, Pa., Oct. 23; Fall Meeting, Meter Committee, Fort Stanwix Hotel, Johnstown, Pa., Oct. 23-24; Prime Movers Committee, Hotel Roosevelt, Pittsburgh, Oct. 30-31; Communications Committee, Hotel Syracuse, Syracuse, N. Y., Nov. 6-7; Fall Meeting, Relay Committee, Robert Treat Hotel, Newark, N. J., Nov. 13-14.

Edison Electric Institute
Transmission - Distribution Committee, Hotel Adolphus, Dallas, Tex., Oct. 23-24.

American Institute of Electrical Engineers
Middle Eastern District Meeting, Commodore Perry Hotel, Toledo, Oct. 28-30; Conference on Machine Tools, Ten Eyck Hotel, Albany, Oct. 29-31; Special Technical Conference on Electrically Operated Recording and Controlling Instruments, Benjamin Franklin Hotel, Philadelphia, Nov. 17-18; Winter General Meeting, Hotel Statler, New York, Jan. 19-23, 1953.

Southeastern Electric Exchange
Sales Conference, Thomas Jefferson Hotel, Birmingham, Ala., Oct. 29-31.

National Association of Railroad and Utilities Commissioners
Annual Meeting, Hotel Marion, Little Rock, Ark., Nov. 10-13.

National Electrical Manufacturers Association
Annual Meeting, Haddon Hall Hotel, Atlantic City, N. J., Nov. 10-13.

American Standards Association
34th Annual Meeting, Waldorf-Astoria Hotel, New York, Nov. 25.

American Society of Mechanical Engineers
Annual Meeting, Statler Hotel, New York, Nov. 30-Dec. 5.

20th National Power Show
Sponsored by American Society of Mechanical Engineers, Grand Central Palace, New York, Dec. 1-6.

Public Utilities Advertising Association
Winter Meeting, Region 2, Claridge Hotel, Atlantic City, N. J., Dec. 4-5.

Institute of Radio Engineers
Joint Electronic Computers Conference with American Institute of Electrical Engineers, Park Sheraton Hotel, New York, Dec. 10-12.

What Lamp Is Best For That Industrial Lighting Job?

Any of several modern light sources offer a lighting quality suitable for most applications. Selection among suitable sources should be made on basis of economy. Cost of electricity and proportions of room to be lighted are most important factors

J. R. JONES, Lamp Division, Westinghouse Electric Corp, Bloomfield, N. J.

Annual cost is the logical determinant of industrial lighting design. The problem facing the illuminating engineer is to decide which light source will result in the lowest annual cost under the given conditions.

Because selection of light source is the deciding factor in cost and because new and improved light sources and reflectors have become available in recent years, a re-evaluation of their merits in industrial lighting appears desirable. Otherwise, improper choice of luminaire for a particular application may result in expense that could have been avoided, in a sacrifice of lighting quality, or both. To this purpose, the information and data in this article have been compiled.

May Be Misleading . . . Frequently attempts are made by the use of general cost studies to prove that this or that lamp is economically desirable. Even when a cost study is impartially made, it is usually based on what are thought to be "average" conditions. The results of a study of this nature are likely to be extremely misleading unless the conditions surrounding the case in which the reader is concerned happen to coincide with those of the cost study. Usually any specific installation departs from the assumed "average" conditions in one or more particulars.

For any given job, the annual cost of lighting is comprised of:

1. Fixed Charge—An allowance covering amortization of investment, taxes, insurance, etc. This is usually taken as approximately 15% of the total installation cost including wiring, hanging of the luminaires, and the cost of the luminaires themselves.

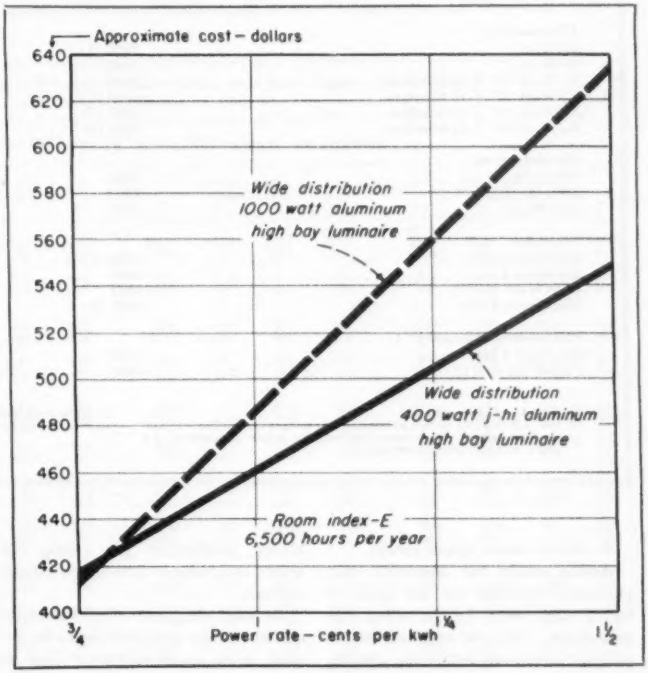
2. Cost of Lamps—In this analysis the emphasis is on high bay areas, and the premise is that any organization having such properties is sufficiently large to be able to purchase lamps at 75% list price.

3. Cost of Power—Power rates vary widely in different sections of the country, and in different types of installations. In this study data are given for power rates of ¾ ¢, 1 ¢ and 1½ ¢ per kwhr.

4. Maintenance—Covers the cost of maintaining the lighting system—including the cost of new lamps, their installation, minor repairs to equipment, and cleaning costs. The cost of labor for replacing lamps and washing luminaires is left for the reader to add because the time required to install new lamps and to clean fixtures varies widely. A simplified method of making the computation is provided by one of the accompanying tables.

The principal variables that affect the choice of light source are:

1. Cost of electricity.
2. Burning hours per year.



COST OF ELECTRICITY may be the determinant. Because of color of light, choice is sometimes between incandescent and fluorescent mercury (J-H1) lamps. At rates above 1¢ per kwhr, the mercury lamp is more economical

Wide Choice of Light Sources for Industrial Applications

Kind of Lamp	Advantages	Disadvantages
Fluorescent Bi-pin 40-W and 90-W Slimline—T-12 6-ft and 8-ft	High efficiency. Long life. Low brightness. Good color quality. Slimlines start instantly and require no starters, thus reducing maintenance.	High installation cost. Large number required. Maintenance may be troublesome. Best efficiency not realizable in narrow areas.
Incandescent 750-W, 1000-W and 1500-W (Higher wattages generally more economical)	Low installation cost. Good color quality. Easily controllable light distribution. Good system efficiency in high narrow spaces.	Low efficiency in light production. Short lamp life in comparison with fluorescent and mercury sources.
Mercury 3000-W A-H9	Long life. High light output per unit	Low efficiency compared with other mercury lamps. Not adapted to narrow [illegible] mercury are
1000-W A-H12	Long life. High output. High efficiency. High illumination levels possible from mounting height over 35 ft. Lamp life independent of starting frequency.	Color deficiency.
400-W E-H1	Lamp life independent of starting frequency. May be burned in any position.	Color deficiency.
400-W A-H1	Long life. Low brightness compared with other mercury.	Not economically competitive with newer 400-W E-H1 and 1000-W A-H12. Color deficiency.
Fluorescent Mercury 400-W J-H1 and 1000-W C-H12	White light. Lamp life independent of starting frequency. Burn in any position. High efficiency.	Like other mercury lamps it does not start immediately at full brightness.

Lamp Ratings and Outputs

	Rated Avg. Life (Hours)	Watts (2) (Inc. Ballast)	Light Output (Lumens)
Fluorescent			
40-Watt	7500 (1)	48.75	2520
90-Watt	7500 (1)	108.50	5400
55-Watt 72" T-12 Slimline	6000 (1)	74.00	3630
67-Watt 72" T-12 Slimline	6000 (1)	90.00	4250
74-Watt 96" T-12 Slimline	6000 (1)	96.50	5000
95-Watt 96" T-12 Slimline	6000 (1)	122.50	6050
Incandescent			
750-Watt	1000	750	15,800
1000-Watt	1000	1000	21,800
1500-Watt	1000	1500	33,000
Mercury			
400-Watt A-H1	6000 (3)	440	15,000
400-Watt E-H1	5000	440	20,000
1000-Watt A-H12	4000	1085	55,000
3000-Watt A-H9	6000 (3)	3165	120,000
Fluorescent Mercury (4)			
400-Watt J-H1	5000	440	18,000
1000-Watt C-H12	4000	1085	50,000

(1) At 3 hours' burning per start.
(2) The watts listed for fluorescent lamps include wattage consumption by lead-less type ballasts. The mercury lamp wattages include consumption of a single lamp high power factor ballast.
(3) At 10 hours' burning per start.
(4) Produce "golden white" light.

3. Room shape (room index).

Among other but somewhat less important variables are the costs of wiring and labor for installing the luminaires. The cost of labor for replacing burned-out lamps can also be significant. In some installations where the luminaires are relatively inaccessible, this item alone is sufficient justification for ruling out either short-life or low-lumen output sources.

At high electricity rates the more efficient lamps usually prove to be the most economical sources. This is particularly true if the installation is to be operated several thousand hours per year.

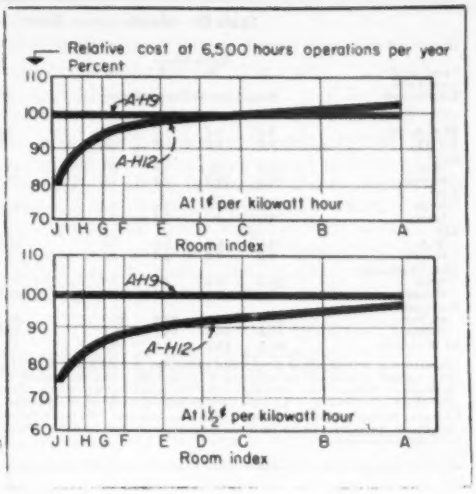
Room Shape Important . . . Although the room shape is frequently the most important factor to consider, its influence is often omitted or minimized in presenting data for cost comparisons. When lighting fixtures having a reasonably widespread light distribution are installed in a high narrow room, a high percentage of the light

Table I—Room Classifications

Room Width (Feet)	Room Length (Feet)	Mounting Height (Feet) 31-38	39-48	49-58	59-68
40	45-90	I	J	J	J
	90-140	H	J	J	J
	50-65	I	J	J	J
50	65-110	H	I	J	J
	110-170	G	I	J	J
	60-90	H	I	J	J
80	80-160	G	H	I	J
	160-200	F	H	I	J
80	80-110	G	H	I	J
	110-170	F	G	H	I
	170-230	E	F	G	H
120	120-180	E	F	G	H
	180-240	D	F	F	G
160	160-250	C	D	E	F
200	200-400	B	C	D	E
300	300-600	A	A	B	C

Room shapes are classified by room index letters. A more complete table may be obtained from any manufacturer of lamps or lighting equipment.

IMPORTANCE OF ROOM PROPORTIONS is shown by relative costs of A-H9 and A-H12 lamps in use, 6,500 hours per year. In general the A-H9 is more economical in wide, low rooms if the cost of electricity is low. The A-H12 is better in all other cases. The A-H12 luminaire has narrower distribution and is more economical in high narrow rooms. As room width increases the economy of the wide distribution unit improves



emitted strikes and is largely absorbed by the walls, and a relatively small percentage reaches the working area. But when fixtures having a concentrating distribution of light are installed in the same area, a high percentage of the light is directed to the working plane, and relatively little light is lost by absorption on the wall surfaces. In rooms that are wide with respect to their height, both types of fixtures direct a very high percentage of the emitted light to the work area.

As a means for selection of proper light source without going through all the detail of a cost study, the tables presented here have been compiled.

The three principal variables—cost of electricity, hours of use, and room shape—are covered in Table II of annual costs of lighting 1,000 sq ft to

Table II—Annual Cost to Provide 40 Footcandles on a 1,000 Square Foot Area

(Does not include labor charges for replacing burned-out lamps or washing luminaires, see Table III).

("A" cost is for 4500 and "B" is for 6500 hours of use per year)

Lamp and Luminaire Distribution		3/4 ¢ per Kwhr Room Index J	H	E	B	1¢ per Kwhr Room Index J	H	E	B	1 1/2¢ per Kwhr Room Index J	H	E	B
A-H9 Mercury	(A)	$508	$396	$303	$170	$590	$348	$248	$199	$762	$450	$314	$258
	(B)	646	382	266	219	772	455	317	261	1080	602	419	345
A-H12 Mercury	(A)	415	282	210	182	461	315	235	204	554	378	288	245
	(C)	533	364	271	235	610	416	310	269	745	508	378	329
A-H1 Mercury Wide	(A)	775	458	351	299	873	509	390	333	1047	610	468	399
	(B)	948	554	424	362	1074	626	480	410	1389	775	594	506
Narrow	(A)	636	479	385	348	730	531	429	386	875	638	515	464
	(B)	860	627	505	455	974	710	570	515	1200	877	705	636
E-H1 Mercury Wide	(A)	553	352	258	224	608	387	276	238	716	456	335	291
	(B)	683	435	319	277	760	485	355	309	917	584	428	372
Narrow	(A)	480	336	275	254	460	368	302	279	543	435	356	318
	(B)	517	414	340	314	577	461	378	350	695	556	456	421
J-H1 Mercury Wide	(A)	733	465	334	288	800	506	364	314	928	590	423	366
	(B)	919	582	419	362	1011	641	461	399	1200	763	549	473
Narrow	(A)	480	375	312	283	532	409	340	316	608	473	396	358
	(B)	602	470	392	354	664	519	432	391	787	615	512	463
1000-W Filament Wide	(A)	799	475	322	270	987	551	374	313	1184	705	477	400
	(B)	1024	610	414	346	1310	730	488	409	1584	940	638	534
Narrow	(A)	491	380	318	289	570	441	370	335	730	564	478	428
	(B)	630	486	408	370	745	575	482	436	978	750	639	570
40-W Fluorescent	(A)	996	593	398	327	1070	635	427	352	1210	780	485	397
	(B)	1113	662	445	366	1220	725	488	400	1428	848	570	469
90-W Fluorescent	(A)	860	586	354	290	950	575	388	317	1112	675	455	378
	(B)	1008	610	411	336	1124	681	460	375	1365	827	556	455
75-W 96" T-12	(A)	979	582	392	322	1050	624	430	344	1190	740	477	378
	(B)	1120	665	448	368	1221	726	487	399	1428	848	570	469

Table III—Maintenance Data[1]

Lamp and Luminaire Distribution	Room Index J	H	E	B	Room Index J	H	E	B
	No. of Luminaires to Clean				No. of Lamps to Replace[2]			
3Kw (A-H9)	2.4	1.4	1.0	0.8	1.8	1.1	0.7	0.6
A-H12	3.8	2.6	1.9	1.7	4.3	3.0	2.2	1.9
A-H1								
Wide	17.7	10.4	7.9	6.7	13.3	7.8	5.9	5.0
Narrow	15.0	10.9	8.8	7.9	11.2	8.1	6.5	5.9
E-H1								
Wide	11.0	7.0	5.1	4.5	10.0	6.3	4.6	4.0
Narrow	8.3	6.7	5.5	5.1	7.5	6.0	4.9	4.5
J-H1								
Wide	13.0	8.3	6.0	5.2	11.8	7.5	5.4	4.6
Narrow	9.0	7.0	5.8	5.2	8.1	6.3	5.2	4.7
1000-W Filament								
Wide	11.5	6.8	4.6	3.9	51.5	30.6	20.8	17.4
Narrow	7.0	5.4	4.5	4.1	31.8	24.5	20.6	18.6
Fluorescent								
40-Watt	65.5	38.8	26.2	21.4	69.5	41.2	27.8	22.8
90-Watt	33.6	20.4	13.7	11.2	35.8	21.7	14.6	11.9
74-W Slimline	81.6	18.7	12.8	10.3	40.7	24.0	16.5	13.6

[1] Assumes that 40 footcandles are provided on an area of 1000 square feet. The figures for other ft-c levels or other square-foot areas may be determined by multiplying by the ft-c required divided by 40, and by the area in thousands of square feet. However, neither the square-foot area nor the illumination level affects the selection of the light source, so it is not necessary to consider the actual area or footcandle level.

[2] Assumes that the installation is operated 4500 hours annually. The figures for other annual burning rates can be determined by multiplying by the actual burning rate divided by 4500. This conversion should be made in any cost comparison.

40 ft-c with the light sources listed in the panel. Because labor costs for replacing lamps and washing luminaires vary over a wide range, they are covered separately in Table III.

Table IV shows the estimated costs for luminaires and their installation that were used in calculating the data of Table II. If the installation cost for an actual case differs appreciably from the cost shown in Table IV, there will be an error in the figure taken from Table II. The values in Table IV are for high bay lighting. At lower mounting heights the cost of fluorescent lighting would be somewhat lower than shown in Table II because of less cost for wiring and for hanging luminaires. Maintenance factors and associated co-efficients of utilization for the different light success are shown in Table V.

Table IV—Estimated Installation Cost Per Luminaire

Type Unit	Fixture Cost	Wiring and Hanging Cost	Total Cost
3 Kw A-H9	$195 (1)	$300	$495
A-H12 Aluminum Reflector	70 (1)	150	220
E-H1, J-H1, and A-H1 Alum. Reflector	35 (1)	125	160
1000-W Filament Alum. Reflector	15	155	170
40-W Fluorescent 2-Lamp RLM	20	54	74
90-W Fluorescent 2-Lamp RLM	33	77	110
75-W 96 in. T-12 Slimline 2-Lamp RLM	43	90	133

(1) All mercury luminaires are assumed to be served by a 220-volt distribution system, the others by a 120-volt system.

Use of the tables is best explained by taking an example:

An area 60 x 200 ft is to be lighted to 30 ft-c. Mounting height is 45 ft. Electricity cost is 1¢ per kwhr, and labor to replace a lamp or clean a fixture is $2. Lighting is used 4,500 hours per year and fixtures are cleaned once a year. What lamp is most economical for these conditions?

Solution Procedure . . . First, the room index is determined from Table I. It is "H." Under 1¢ per kwhr, Column "H," Line A, Table II, the A-H12 lamp appears the most economical, $315. To this must be added the annual costs of cleaning fixtures and replacing lamps. Table III shows 2.5 luminaires required, which, cleaned once a year at $2 each, results in $5 cleaning cost. The same table shows 3 lamp replacements per year, which at $2 each for labor is $6. The total annual cost for the A-H12 is $326, lowest of all.

But maybe color discrimination is required or perhaps women workers object to the greenish tinge on their complexions, ruling out the A-H12. The choice then lies between the color-corrected J-H1 mercury and the 1,000-w incandescent units with narrow spread reflectors, with figures from Table II of $409 and $441 respectively. Adding maintenance costs brings the incandescent lamp up to $500.80 and gives the choice to the J-H1 with $435.60.

Cost Estimate . . . These cost figures are for 40 ft-c over 1,000 sq ft, but the problem specifies 30 ft-c over 12,000 sq ft. They can be made applicable to the problem conditions by multiplying them by 30/40 and by 12,000/1,000. But this does not change their relative values and the choices as derived from the tables remain the same. The proportionate change results in an estimate of cost for the particular job.

Special Considerations . . . In areas where specular materials are being fabricated or inspected, fluorescent lamps are desirable because of their low brightness. Reflected images of high brightness sources, such as filament or mercury lamps, create uncomfortable seeing conditions and reduce the visibility. In many cases where a source brightness somewhat higher than that of the fluorescent lamp can be tolerated, the J-H1 can be used because its brightness is only about 75 candles per sq in.—far less than that of either incandescent lamps or the other mercury sources.

Illumination levels are normally specified for and measured on the "working plane," a horizontal surface 30 to 36 in. above the floor. Concentrating units provides light on this surface more economically than fixtures with a widespread distribution, but the working plane really is not the surface that should be considered if the seeing task is located on an inclined plane. Therefore, fixtures with a widespread distribution may be necessary for some applications.

Table V—Maintenance Factors

Lamp Type and Luminaire Distribution	Maintenance Factor	Coefficients of Utilization Room Index J	H	E	B
Mercury					
A-H9	.60	.32	.39	.56	.68
A-H12	.63	.30	.44	.59	.69
A-H1					
Wide	.70	.22	.37	.49	.57
Narrow	.65	.28	.38	.47	.53
E-H1					
Wide	.65	.28	.44	.60	.69
Narrow	.60	.40	.50	.61	.66
J-H1					
Wide	.65	.26	.41	.57	.66
Narrow	.60	.43	.55	.66	.73
Filament					
1000-Watt					
Wide	.65	.35	.42	.68	.74
Narrow	.60	.44	.57	.68	.75
Fluorescent					
40-Watt	.55	.22	.37	.55	.67
90-Watt	.55	.20	.33	.49	.60
74-Watt					
Slimline	.55	.22	.37	.55	.67

The cost data in Table II are inversely proportional to the Maintenance Factor and Coefficients of Utilization. The figures listed above were used in calculating Table II.

WASHINGTON COMMENT

JESSE MOCK

Republican Presidential candidate Dwight D. Eisenhower has succeeded in drawing the line between his own views on public power development and those of the present Democratic administration.

Whether he can or should attempt to draw the same kind of a line between his own and the views of his Democratic opponent, Adlai Stevenson, is still a problem for the Republican campaign strategists.

Truman's Views Overshadow Stevenson's . . . As this year's campaign went into the home stretch, there was no doubt that President Truman's pronouncements on the subject completely overshadowed the contrasting suggestions of Governor Stevenson. And neither Truman nor Stevenson had bothered to stress the time element. There was no great effort to impress audiences that Truman was supposedly talking about the past and Stevenson about the future.

For the Democrats, the situation appeared compromising to say the least. While Eisenhower stuck to the "middle of the road," the two top Democratic campaigners were cast in the role of working both sides of the street.

What this may mean in votes, a Washington correspondent is in no position to say. Nor will the Nov. 4 election give any decisive answer. Reason is that the power issue is, at this writing, still a secondary one. Election results are more likely to depend on a number of other issues of more immediate concern to a great preponderance of the voters. Most of them have no idea of the importance of the power issue.

Both the candidates, as well as President Truman, are guilty in some degree of obscuring their statements on power development by use of such vituperative phrases as "whole-hog government," "front for the power lobby," and "sacred right of private monopoly to leave a region undeveloped." But underneath this barrage aimed at their adversaries, both candidates have brought forward some ideas of their own.

Eisenhower's Public Power Policy . . . In his Seattle speech in early October, Eisenhower made these points on public power policy:

- Power development in the Northwest can and must go forward. More upstream storage dams are needed.
- State and local governments should wield greater influence in planning and developing power and other public works projects. But the federal government must bear its share of the responsibility.
- It should be possible for state and local governments eventually to acquire self-liquidating projects in order to avoid perpetual control by the federal government.

Stevenson's Public Power Policy . . . Compare this attitude, now, with the proposals made a month earlier in Seattle by Stevenson. The Democratic candidate made these suggestions:

- Better administrative arrangements are needed within the government for coordinating the federal role in public works.
- Extensive power development requires intelligent and coordinated action by the states, localities, and private enterprise.
- Proposed federal projects should come in for strict review to determine whether they should be undertaken.

Even from this brief summation, it is apparent that there is less disagreement between the candidates than there is between Stevenson and Truman. This Stevenson-Truman contrast is even more marked in their attitudes toward the role of free enterprise in electric development.

There is one drawback to taking these views too seriously. They come strictly from campaign oratory. But there is also some danger of not taking them seriously enough. Both Eisenhower and Stevenson are generally credited with having a high degree of personal integrity.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Bus regulation over 5% range at ten metropolitan substations of 4 to 6 Mva could be achieved with 22 regulators aggregating 6400 kva. This would dispense with all but two of 79 present feeder regulators aggregating 13,400 kva.

Loss of electrical load on a unit boiler-turbine combination prompts some operating companies to shut down a reheat boiler completely; others prefer to fire at reduced rate until duration of the emergency can be determined.

Low-growing trees hardly reach up to line-wire level. No trimming necessary. Varieties are hornbeam, golden rain, globe-headed elms, linden, basswood, locust.

Regenerators for gas turbines are big, bulky and expensive, thus diluting the space compactness of the gas turbine itself. Escape route is promised in the direction of exchanger tubes with fin-extended surfaces. Deduction of 60% in volume and 38% in weight is indicated.

Network switches have not been rated to derive the full benefits of permissible transformer loading.

Alloys to deliver 1200 psig-steam have to work in a furnace atmosphere that results in up to 1350 F of tube surface temperature. They are available (technologically) and show generally better resistance to gas corrosion outside then to steam attack inside.

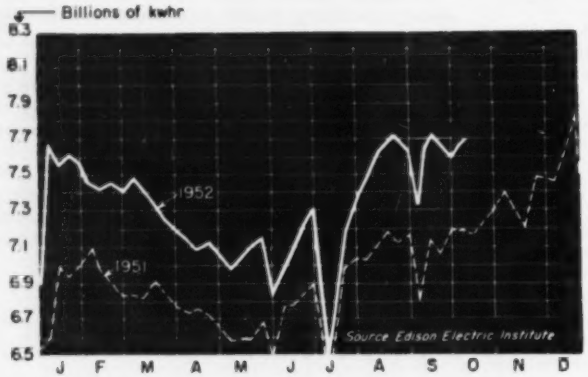
Pole-hole diggers can be used in conjunction with air compressors for removing boulders, backfill tamping, etc.

Transformer insulations of Class B and Class H generated only 10 to 30% as much toxic gas when in a sealed unit as Class A.

Root injury to shade trees by excavation for underground distribution could readily harm them more than pruning them to clear the conductors of an overhead distribution system.

Punch cards may prove a practicable means of guiding system operators in handling line loadings for minimized losses when interconnections are intricate.

STATISTICS



Output Week Ended Oct. 11—7,697,880,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Oct. 11	+7.5	+10.6	+5.3	+7.3	+8.6	+11.2	+7.9	+9.4	−3.3	+10.2
Oct. 4	+7.1	+7.8	+4.4	+6.7	+7.8	+10.8	+7.4	+11.1	−2.0	+11.3
Sept. 27	+7.4	+9.0	+4.6	+7.4	+7.9	+11.2	+8.3	+10.5	−1.9	+9.1

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load (Million Kw)	July	67.2	67.0	63.1
Capacity (Million Kw)	Aug.	78.31	77.96	73.62
Production (Billion Kwhr)	Aug.	34.36	32.52	32.40
Hydro		8.52	8.74	7.82
Fuel		25.84	23.78	24.51
Fuel Consumption				
Coal (Million Tons)	July	7.90	7.66	8.08
Oil (Million Barrels)		4.38	3.91	4.43
Gas (Billion Cu Ft)		98.71	89.29	83.20
Sales (Billion Kwhr)	July	27.70	27.67	26.50
Residential		7.50	7.44	6.55
Commercial		5.30	5.00	4.70
Industrial		12.64	13.20	13.13
Other		2.25	2.03	2.12
Net Income Class A & B Companies ($ Million)	Aug.	68.67	64.62	53.33
Estimated Dec. 52 Peak (Million Kw)	July	80.1	80.0	78.8
Kwhr per Residential Customer (12 Month Average)	July	2,104	2,091	1,933
Revenue per Kwhr Residential Service (12 Month Average)	July	2.78¢	2.78¢	2.84¢
Canadian Production (Billion Kwhr)	July	4.84	4.99	4.63

Business Statistics

FRB Industrial Production Index†††	Sept.	228	218	223
Gross National Product Annual Rate ($ Billion)	2ndQtr	343.2	339.4	329.3
E. W. 5 Industry Production Index	Sept.	123.5	120.5	123.5
ENR Construction Cost Index††	Sept.	122.9	122.4	113.8
BLS Consumer's Price Index	Aug.	191.1	190.8	185.5
NEMA Insulation Materials Sales Index†	July	470	500	494
NEMA Electric Appliance Sales Index†	July	234	258	181
NEMA Household Refrig. Sales Index†	July	197	192	97
Metal Prices. (Oct. 14)				
Copper, Conn. V., lb		$ .24½	$ .24½	$ .24½
Lead, N. Y., lb		.14	.16	.19
Zinc, prime Western E. St. Louis, lb		.13½	.14	.19½
Tin, Straits, qual. N. Y., lb		1.21½	1.21½	1.03
Aluminum, ingot, base price		20	20	19
Nickel, base price		.56½	.56½	.56½
Steel, billets, Pitts., ton		59.00	59.00	56.00
Steel, scrap, No. 1 heavy, Pitts., ton		45.00	45.00	45.00

* Estimated. † 1936=100 †† 1949=100 ††† 1937-39=100 (Unadjusted)

Class A & B Companies Have $21 Billion in Plant

Total investment in electric plant by class A and B electric companies amounted to $20,756 million according to Federal Power Commission data just released.

Of this amount electric plant in service accounted for $19,191 million or 92.5%.

The balance of construction work in progress at the end of 1951, $1,216 million, accounted for 5.9% of the total electric plant.

Electric Plant—1951

	$Million	%
Electric plant in service	19,191	92.5
Electric plant leased to others	71	0.3
Construction work in progress	1,216	5.9
Electric plant held for future use	27	0.1
Electric plant acquisition adjustments	251	1.2
Total	20,756	100.0

Electric plant acquisition adjustments representing the excess of the purchase price of electric utility property over its original cost, amounted to $251 million or 1.2% of total plant.

The remaining two summary accounts, electric plant leased to others, and electric plant held for future use, together amounted to $97 million, or 0.4% of total plant.

Of the electric plant in service, distribution is generally known to be the largest element. It has been spoken of as anything from a third to half of the total. The FPC reports that the proportion of distribution in total investment is 41.4%.

Electric Plant in Service—1951

	$Million	%
Steam plant	5,880	30.7
Hydraulic plant	1,716	8.9
Internal combustion plant	93	0.5
Total production plant	7,689	40.1
Transmission	2,866	14.9
Distribution	7,952	41.4
General	662	3.5
Intangible plant	22	0.1
Total	19,191	100.0

Investment in distribution facilities by the class A and B companies amounted to $7,952 million.

Production plant, the second largest element of utility investment accounts for 40.1% of the total, $7,689 million.

Transmission investment amounted to $2,866 million, or 14.9%.

General plant investment which includes the cost of office and general service buildings, transportation, stores, shop, laboratory, and other generally used equipment amounted to $662 million, or 3.5% of the total.

Intangible plant amounted to $22 million.

Analysts View Fast Amortization

Survey by twelve financial experts shows what information they need and how they will treat it

MARJORIE H. CRUTHERS, Irving Trust Co, Wall Street, New York

Accelerated amortization of emergency defense facilities by utility companies has many aspects. As the resulting reduction in income taxes may have a substantial effect on reported earnings of some companies, accelerated amortization will become of paramount importance to financial analysts in their appraisal of securities. Because of its possible significance in security valuation utility companies may be interested in the interpretation placed on it by security analysts.

Periodically the Irving Trust Co checks with a few top utility analysts to find out what their current problems are in evaluating securities. The findings are then passed along to utility companies, through an Information Bulletin, to aid them in keeping the analysts informed of their operations.

The latest bulletin is the result of a survey of and discussion with 12 analysts.* During the discussion the following topics were covered:

- What information do the financial analysts need in their appraisal of securities?
- How can it best be presented to them?
- How will they evaluate the additional income arising from the tax reduction?
- How will they treat the accumulated amount in the balance sheet?

Information Needed . . . Throughout this article the term "tax reduction" has been used for reference purposes. It is not meant as an inference on the nature of the item. The analysts realize that if there are no changes in the tax rate or form or in factors affecting the calculations of the tax, there will be a corresponding increase in taxes distributed throughout the remainder of the life of the property. Under these circumstances the effect is actually a deferment of taxes.

The survey replies stressed the importance, to utilities, of furnishing adequate information promptly. This helps to prevent misinterpretation of the facts and helps to take the guess work out of analysis.

A definite program for providing information to all analysts could help decrease the number of individual requests. One means of presenting the matter would be through a special release explaining the company's policy at the time it is established. This could be sent to those on its mailing list of representatives in the financial community. It does not need general circulation, for the uninformed investor is not usually interested in this type of information. Most analysts like to have particularly detailed information. The 12 professionals consulted indicated they would like to have the items listed below spelled out in this initial release:

1. Description of the property, estimated completion date, estimated cost, estimated amortizable amount.
2. Amount of annual amortization and comparable amount of normal depreciation for income tax purposes.
3. Estimated annual tax savings on basis of present tax rate.
4. Manner in which the company handles the items in the income statement and balance sheet.
5. The order, or a summary, thereof, of the state regulatory authorities on accelerated amortization.

Well Done . . . Several very fine releases, which furnished most of the above information, have been prepared by utility companies. One particularly well done example was distributed by Cincinnati Gas & Electric Co, another by California Oregon Power Co.

It is not necessary to prepare a new release each time a certificate of necessity is issued on additional properties. Once the basic information has been reported, any changes can be noted in the annual and quarterly reports. However, the analysts agree that it is important for the company to review the situation and bring the special release up to date in the annual report. It would also be helpful to have an explanation of current developments in the regular interim reports.

The analysts would like to know of any special restrictions applicable to the surplus account which may be affected by the accumulated earnings arising from the tax reduction. For example, if a company's charter includes a provision which makes dividend payments dependent on the ratios of common equity to total capitalization, will it be possible to include the special surplus in figuring this ratio? As another example, if a company's unsecured borrowing power is limited to a percentage of the total capitalization, can the special surplus be included in such a calculation?

The analysts also indicated they were interested in the amount, if any, of the dividend payment which is a return of capital, for income tax purposes. A utility company might consider explaining these situations in footnotes.

Analysts' Treatment . . . In addition to asking about the information the analysts wanted from the companies, the survey turned the tables and canvassed the analysts on how they will use the data given to them in evaluating securities. It should be understood that the replies represent their ideas on the situation as it is today and that future developments may alter their thinking.

One question put to the analysts was —"In calculating earnings-price ratios for analytical purposes in evaulating security prices, how will you treat the tax reduction in the earnings-per-share figure?" Security analysis is not a science but rather a matter of judgment and the replies to this question presented a variety of opinions. Furthermore, most of the answers could not be tabulated without the addition of explanations.

Eight of the 12 analysts indicated that they will consider using earnings figures both including and excluding

* Copy of complete survey may be obtained from Irving Trust Co, One Wall St, New York 15, N. Y., upon request. The analysts consulted included: Marvin Chandler, Paul Donnan, Owen Ely, Titus Fowler, James Hurd, W. Truslow Hyde, Theron Locke, George Nye, Hugh Pastoriza, Lawrence Ryan, Charles Tatham and Longley Walker.

any additional income. Two of these answered without any qualifying remarks. Four in the group of eight who will use both earnings figures, said their tendency would be to place emphasis on earnings excluding the benefit of the reduction in taxes. The other two analysts in this group of eight will use the figures reported by the companies. If the amount is large, they will apply judgment to each individual case. Of the remaining four of the twelve analysts, three will not include any benefits of the reduction in taxes arising from accelerated amortization in their earnings-per-share figures, while the other one will include the extra income in his calculations.

Thus, there is no set formula which all analysts will use in arriving at earnings-per-share. However, the majority seem to feel that they will examine both figures, then, if the item is large, give more emphasis to the figure excluding the extra income. This would indicate that companies might consider showing earnings-per-share on both basis, before and after the tax reduction, assuming a regulatory commission has not established the form for a company to follow.

More Unanimity . . . The analysts were more united in their opinions on the question as to how they will treat the results of the tax reduction in the balance sheet. The question on this point was, "In the balance sheet will you include the additional income generated from the tax reduction as a part of surplus when calculating capital structure?"

They all agree that if it is reported as a segregated surplus, not available for dividend payments, then they will include it as part of the surplus. On the other hand if it is reported as a special reserve for deferred taxes only, four will consider the account as part of surplus while the majority will not include it in computing capital structure ratios.

The survey directed the question to the analysts concerning the balance sheet under only the two headings, reserve for deferred taxes or segregated surplus. It is conceivable that the reactions would have been different to other headings. In addition to the titles the actual position of the accumulated income account on the balance sheet may have some effect on how it will be treated. In other words, whether it is placed with the capitalization accounts or with deferred credits and reserves.

The analysts do give weight to the fact that the individual company knows its own situation best and would have definite reasons for using a particular accounting procedure. As mentioned above, analysts are interested in how this special surplus may affect restrictions on dividend payments or unsecured debt limit. Such provisions might have some influence on the analysts' treatment of the account in the balance sheet.

As would be expected, the survey showed there is not complete uniformity in the way analysts will handle the results of accelerated amortization, for financial analysis is so much a matter of judgment. However, the majority are in reasonable agreement and the survey clearly indicated its importance in evaluating securities in the electric industry.

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE 1952									
Oct. 9	**3.00**	**3.03**	**3.17**	**4.19**	**4.27**	**4.49**	**5.23**	**5.00**	**6.03**
Oct. 2	2.00	3.03	3.16	4.11	4.25	4.59	5.18	5.57	5.98
3rd 1952	2.99	3.03	3.16	4.10	4.26	4.61	5.18	5.59	5.96
2nd 1952	2.95	3.00	3.09	4.05	4.31	4.60	5.38	5.85	6.42
1st 1952	2.95	2.99	3.13	4.11	4.29	4.66	5.35	6.03	6.47
4th 1951	3.02	3.07	3.21	4.32	4.50	4.91	5.42	6.18	6.84

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months Ended		Net Income 1952	Net Income 1951	Earnings Per Common Share 1952	Earnings Per Common Share 1951
California Oregon Power	12	Sept.	$13,381,351	$11,674,745	$....	$....
Iowa Electric Light & Power	12	Aug.	2,113,995	1,572,245	....	....
Maine Public Service	12	Aug.	368,228	344,437	1.44	1.33(a)

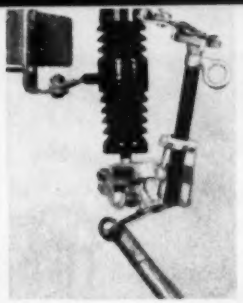
Notes—(a) Based on present shares outstanding.

FINANCING

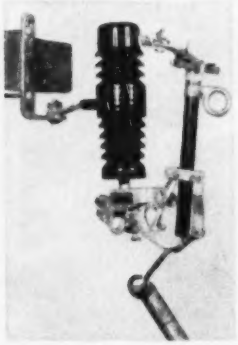
Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
WEEK OF OCTOBER 9-15			
Bonds			
California Oregon Power—1st mtg 3¼% 1982	$7,000	101.749	3.53%
Utah Power & Light—1st mtg 3½% 1982	10,000	100.742	3.46%
Common Stock			
Long Island Lighting—599,942 sh (being offered commonholders on 1-for-7 basis, record Sept. 24 to expire Oct. 9; Blyth & Co —First Boston Corp. underwriters)	$9,299	$15.50	5.81%
Iowa Public Service—150,122 sh (being offered commonholders on 1-for-8 basis, record Sept. 25 to expire Oct. 14; stockholders being allowed over-subscriptions; no underwriting)	3,153	21.00	6.67
WEEK OF OCTOBER 16-22			
Bonds			
Carolina Power & Light—1st mtg 1982	$20,000	....	....
Virginia Electric & Power—1st mtg 1982	20,000	....	....
Common Stock			
Sierra Pacific Power—26,775 sh (being offered preferred holders on 1-for-6 basis and commonholders on 1-for-12 basis, record Oct. 6 to expire Oct. 20)	$616	$23.00	6.96
SCHEDULE FOR OCTOBER TO DECEMBER			
Bonds			
Long Island Lighting—1st mtg 1982	$20,000	....	Nov. 18
Gulf States Utilities—1st mtg 1982	10,000	....	Nov. 24
New Orleans Public Service—1st mtg 1982	6,000	....	Dec. 15
Common Stock			
Hawaiian Electric—50,000 sh (being offered commonholders on 1-for-10 basis, record Oct. 3 to expire some time in November; no underwriting)	$1,000	$20.00	10.00%* Nov. 19
Duquesne Light—250,000 sh†	....	....	....
UNSCHEDULED AND UNDER CONSIDERATION			
Bonds			
Central Maine Power—1st general mtg	$6,000	....	....
Kansas City Power & Light—1st mtg	12,000	....	....
California Electric Power—1st mtg	10,000	....	....
Toledo Edison—1st mtg	7,500	....	....

Notes—* Dividends are subject to 2% Hawaiian withholding tax. If this tax is deducted, the yield would be 9.80%. † 170,000 shares will be sold by Philadelphia Co and 80,000 shares will be sold by the company as "new money."

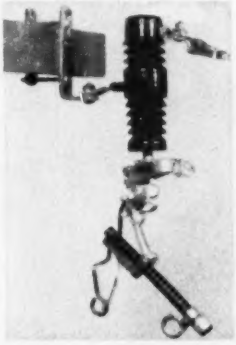
1 Fuseholder assembly showing how fuse-link cable passes over lever arm of load-break device.



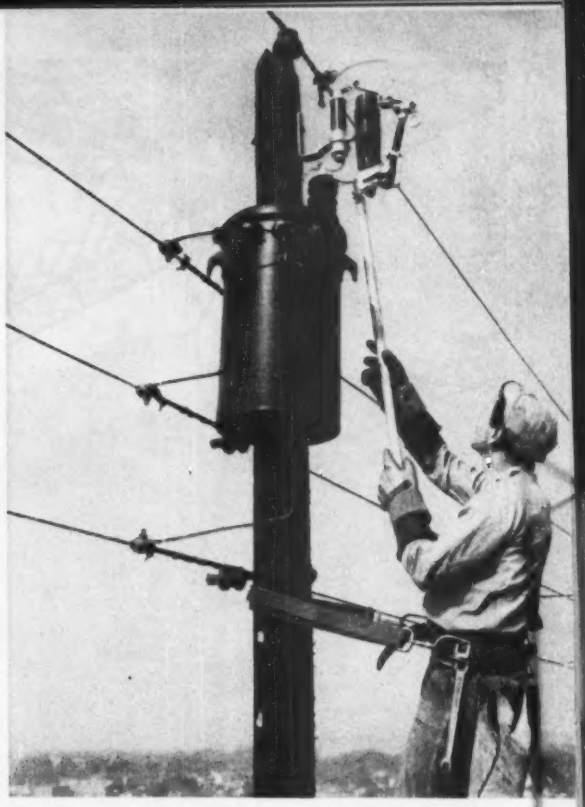
2 Downward pull on switchstick inserted in hook-eye breaks fusible element of fuse link.



3 When fuse link breaks, the cutout interrupts load current as it would interrupt a low fault current.



4 After current interruption, fuseholder drops open removing itself from the circuit.



New G-E Load-break Cutout provides easy low-cost load switching . . . sectionalizing

Liberal design of G-E cutouts permits simple load-break device

General Electric's Open Dropout Fuse Cutouts—7.8 kv and 15 kv, 100-ampere ratings—now feature an optional load-break device. With it, you can switch loads or sectionalize your distribution circuits with but little increase in your cutout investment.

Fast, safer switching. The new load-break device operates by breaking the fusible element of the fuse link ***with arc-interruption occurring inside the fuseholder tube.*** It provides fast, safer switching of either inductive or capacitive load currents up to the 100-ampere continuous rating of the cutout. By substituting load-break fuseholders for conventional fuseholders—both 2000-ampere and 5000-ampere ratings—cutouts already in service are converted to load-break operation.

Liberal design of G-E cutouts for full-range current interruption makes them ideal for breaking load currents. It also permits an extremely simple load-break device that consists only of a stainless steel lever arm coupled to the cutout fuseholder. The load-break device has no awkward protrusions or parts to stick, bind or otherwise interfere with the dropout action of the cutout. And it does not interfere with fusing or inserting and removing the fuseholder by switchstick.

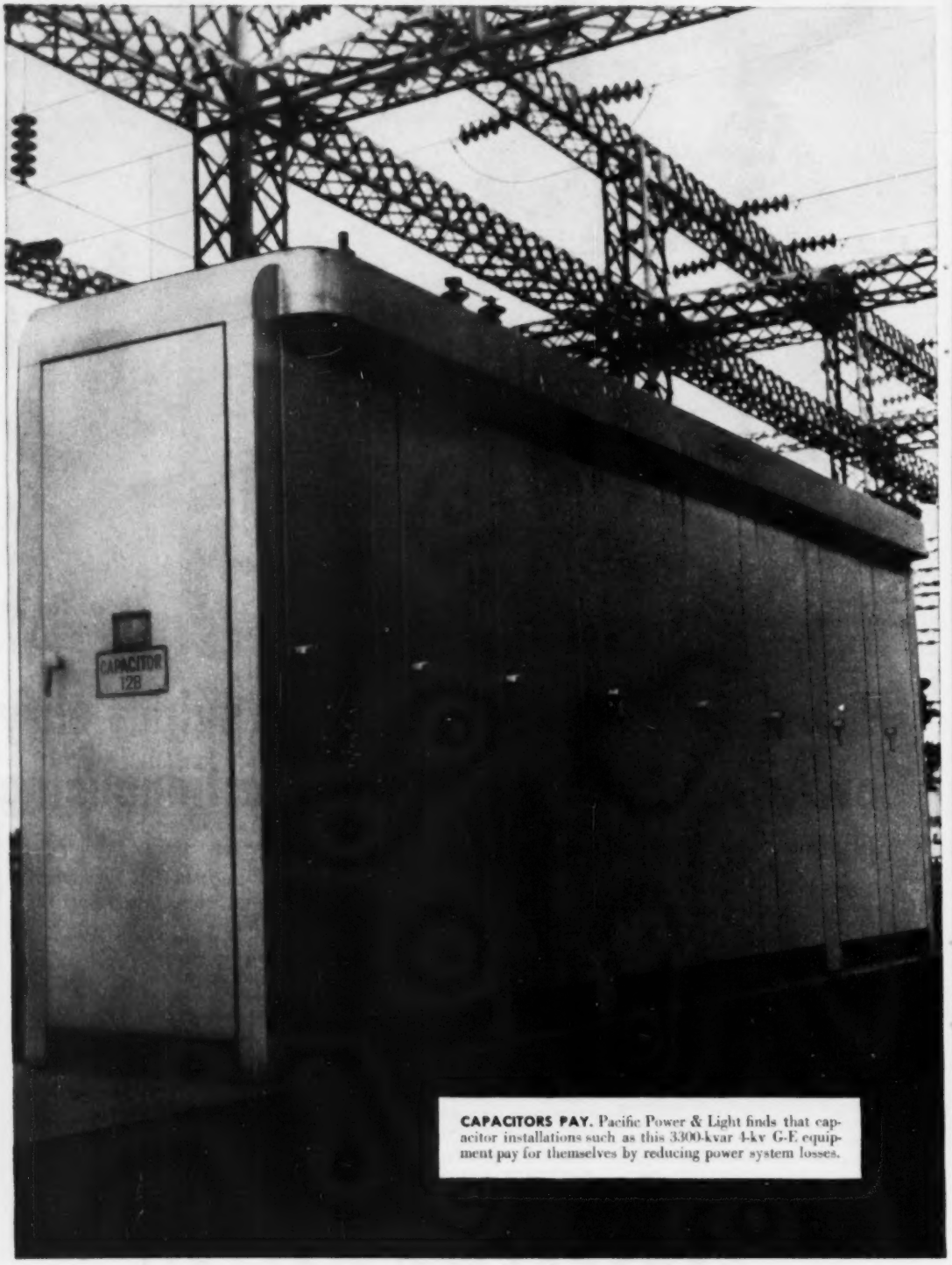
For more information on this, and other cutouts, write to ***General Electric Company, Schenectady 5, New York.***

406-45

G-E OPEN DROPOUT FUSE CUTOUTS OFFER YOU MANY UNIQUE "EXTRAS"

- **"Birdproof construction" eliminates unnecessary fuse blowing.**
- **Close coupling of fuseholder to insulator, plus shock absorbers, reduces recoil stresses.**
- **Sealed upper end on fuseholder excludes water and controls expulsion gases.**
- **"Hinge guides" eliminate side-sway, provide positive contact engagement.**
- **Interchangeable standard and heavy-duty fuseholders — 2000-amp. and 5000-amp. interrupting ratings.**

GENERAL ELECTRIC



CAPACITORS PAY. Pacific Power & Light finds that capacitor installations such as this 3300-kvar 4-kv G-E equipment pay for themselves by reducing power system losses.

Loss reduction alone pays for capacitors on Pacific Power & Light Co. system

Capacitors save 50,000,000 kw-hrs annually

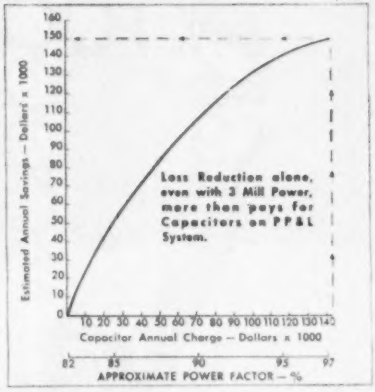
In its progressive program of power-factor improvement, Pacific Power & Light has installed 142,000 kvar of capacitors . . . 51% switched. This amounts to 1 kvar for every 2.43 kw of its 345,000-kw peak-load capacity.

Capacitors raise PF—reduce losses. Without these capacitors P P & L's power factor would be 82%—annual losses 285 million kw-hrs. In 1951, *with capacitors*, its power factor was 97%—losses 235 million kw-hrs.

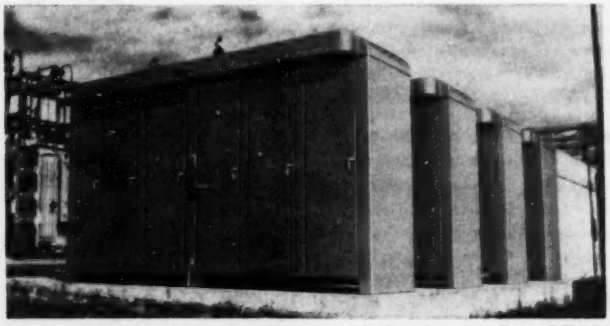
$150,000 saving pays for capacitors. Even at 3 mills per kw-hr this represents a $150,000 saving each year. Annual cost of carrying the 142,000 kvar of capacitors installed is $142,000 ($8 per installed kvar capitalized at 12½%). Thus, the saving on power losses alone more than pays for the capacitors.

Bonus of better voltage—reduced loading. Calculations show that the capacitors reduced voltage drop in overhead circuits by 23 to 48%, depending on conductor size and length. And they released an estimated 15% of kw capacity. Both at no extra cost!

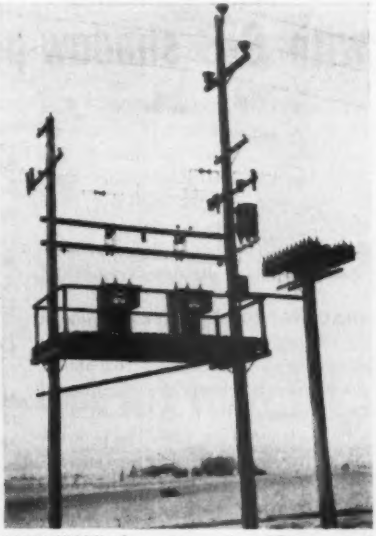
Many types of reliable General Electric capacitors are available to help you reduce losses on your system. They're economical to install, require practically no maintenance. For information call your nearest G-E Apparatus sales office, or write to Section 407-37, General Electric Company, Schenectady 5, New York.



SAVING ON LOSSES. Graph compares annual saving on losses with annual charge for capacitors as P P & L improved its power factor.

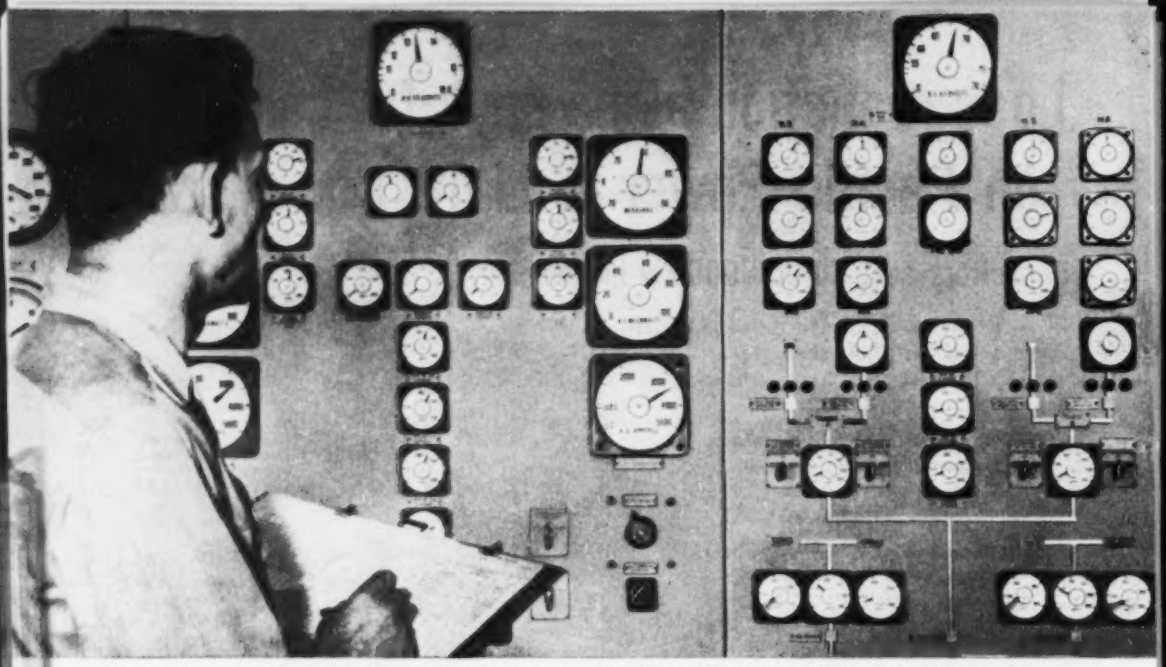


60,000 KVAR of capacitors—about 99% switched—have been installed at P P & L substations. The four 1500-kvar, 4-kv G-E equipments above are installed at the Company's Pendleton, Oregon substation. They supply bulk kilovars that reduce substation thermal loading as well as system losses.



82,000 KVAR of capacitors—about 17% switched—have been installed on distribution circuits. 600 kvar of G-E capacitors above are installed next to voltage regulators near Sunnyside, Wash.

GENERAL ELECTRIC



EMPLOYEE OF NEW YORK S CONSOLIDATED EDISON TAKES READING FROM GENERAL ELECTRIC AB-16 AND AB-18 SWITCHBOARD INSTRUMENTS

Consolidated Edison cuts reading time with G-E shadow-proof instruments

Consolidated Edison of New York reports on General Electric switchboard instruments: "Since installed in late 1950, the G-E instruments have satisfactorily provided the increased readability and accuracy needed for this type of installation, especially since reading at greater distance is required."

SHADOW-PROOF COVERS are one of the reasons why G-E switchboard instruments are so easy to read—from almost any position in front of the switchboard. The instrument dial is set forward, flush with the front of the case. The protruding, convex-type glass cover provides all-around illumination. Covering overhang and overhead lighting shadows are eliminated.

COMPLETE INSTRUMENT LINE includes 4½-inch (Type AB-, DB-18) and 8¾-inch (Type AB-, DB-16) rectangular indicators, plus accessories. Recorders are also available—ink and inkless, round and strip chart, flush and surface mounted, single and duplex.

SMALL SIZE AB-, DB-18 indicating instruments (4½-inch) are used for modern centralized control boards where space is limited. Twenty-five instruments can be mounted on a 24-inch square panel. Large, clear markings make for easier, more accurate readings.

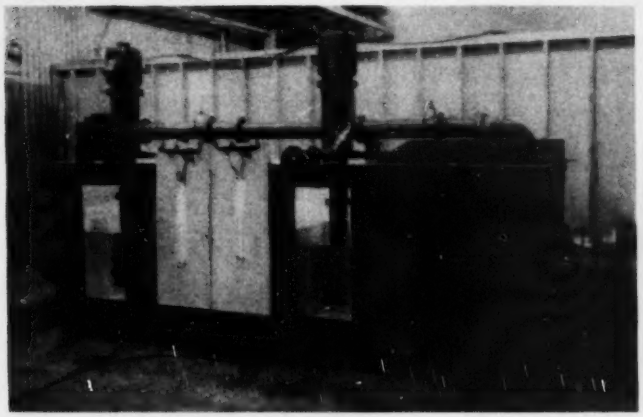
LARGE SIZE TYPE AB-, DB-16 (8¾-inch) indicating instruments are designed for applications where readings must be taken at a distance. The double-sized scale and pointer make this instrument ideal for use on swinging brackets and other installations that are necessarily remote from the observer.

FOR MORE INFORMATION write or call your nearest G-E apparatus sales office. For bulletin on switchboard instruments, write for GEC-218, Section 602-235, General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

EASY AND ECONOMIC SERVICING assured by "unit" design; entire assembly is removed without disturbing calibration.

STURDINESS: a main feature of the AB-, DB- instrument line. Jewels are spring mounted to minimize damage to pivots.



EQUIPPED WITH WINDOWS for flow observation, test flume includes tank 12 x 3½ x 3½ ft, model pumps with 7-in suction bell, 5-in discharge bell. Pumps are rated at 750 gpm, 12-ft head, 3,500 rpm, require about 3 hp to simulate field installation

VORTEX BLEEDING AIR INTO PUMP was solved by grid rafts floated on surface. Baffles merely pushed vortex to new location

Solving Pump Intake Problems with Model Flume

W. W. WELTMER, Hydraulic Engineer, Centrifugal Pump Section, Allis Chalmers Mfg Co, Milwaukee, Wis.

A model test flume, one-seventh the size of average installations, has been built by Allis Chalmers Co to study underwater pumping conditions. Work is divided into general research—formulating general design procedures for condenser circulating water pump intakes, testing specific installations, studying actual installations and designs to determine if they are satisfactory and if not, how to correct them.

One conclusion reached is that there is no typical intake. The possibilities for differences are great and the actualites are just about as great. Another conclusion is that the geometry of the intake determines the flow distribution and therefore the submergence needed to eliminate vortices which ventilate the pump. The rule of thumb that "one foot plus three times bell mouth velocity" gives adequate head has been proved by tests to be invalid. With some good flow conditions, less submergence is required; with other slightly poorer flow conditions, much more submergence is needed. Tests have proved the importance of even flow distribution, as well as low flow losses.

Some intakes studied might be called deadends, where the circulators handled all the water that came to them. In other intakes, the circulators were disposed along a tunnel and peeled off their portion of the flow from a larger flow whose remainder went past them to other units. To test these intakes, an external circulating system whose capacity is six times that of the model pump, was built into the system.

Flow is observed by following finely divided air injected into the water. The small bubbles are made visible by underwater lights. Localized distributions are explored with small rubber pellets and with threads attached to the end of a small probe. Surface disturbances such as vortices which bleed air into the pump from the surface, are studied by reducing velocity and thereby reducing pump capacity.

Check Street Lighting Relays with Less Time and Effort

BURKE BREEDLOVE, Junior Engineer, Electric Meter Division, San Diego Gas and Electric Co

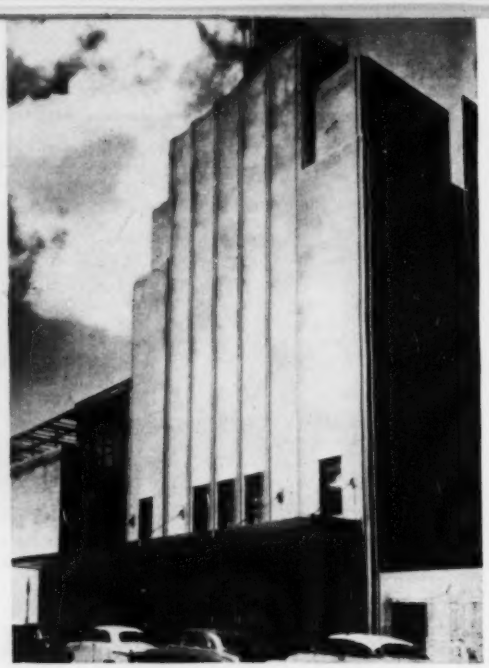
Test box for checking and adjusting the light-level of photo-electric street-lighting-control relays saves considerable time and effort for San Diego Gas & Electric Co over the former practice of testing relays against a standard lamp. Because control units are of like construction, the comparative method of testing subsequent units gives matching characteristics.

Set consists of two receptacles for relay units and holders for a 2.5-v flashlight lamp used as the comparator lamp, and a 120-v candelabra base load control lamp all mounted within a lightproof box. On the front panel are mounted a power switch, two control switches, a lamp control potentiometer knob, two red load-indicating lamps, and a 300-ma ammeter. Because the milliammeter is in series with four flashlight cells, it preferably should be of low resistance to allow the potentiometer to have maximum control over the current.

In operation, standard and test relays are inserted, power switch is turned on, and units are allowed to warm up to normal operating temperatures. To speed multiple unit checking, separate warm-up of additional units is of value. With the top of the box closed, the comparator lamp, which gives equal light to both relays,

(*Continued on page* 126)

TELEVISION POWER BREAKER. The 500-kva G-E unit substations at WWJ-TV have voltage ratings of 4800-208Y/120, are equipped with Type AK-1-25 air circuit breakers.



WWJ's NEW BUILDING houses studios of Detroit's pioneer TV station. General Electric load-center system furnishes power for amplifying, lighting—other station requirements.

Detroit's new TV studios rely on

Power continuity assured for all studio requirements at WWJ-TV by secondary-selective distribution system

For the engineers of WWJ-TV—Detroit's pioneer TV station and an affiliate of WWJ, the world's first commercial radio station—a dependable source of continuous power rates first consideration in planning the new television studios. Total or even partial power shutdown cannot be tolerated.

At its new studios, WWJ-TV needs reliable power for lighting and amplifying . . . for its monitor panels and relaying equipment . . . for all station auxiliaries such as fans and blowers. To assure reliable power continuity for these many exacting requirements, Giffels & Vallet, Inc., L. Rossetti, associated engineers and architects, and Jack A. Frost, electrical contractor, installed a G-E secondary-selective load-center system consisting of two 500-kva unit substations.

With this distribution system, the station gains, too, in savings basic to load-center power. For example, a G-E engineered load-center system maintains consistent voltage for top operating efficiency, keeps voltage drop down to a minimum, provides less costly feeder breakers, and reduces cable costs.

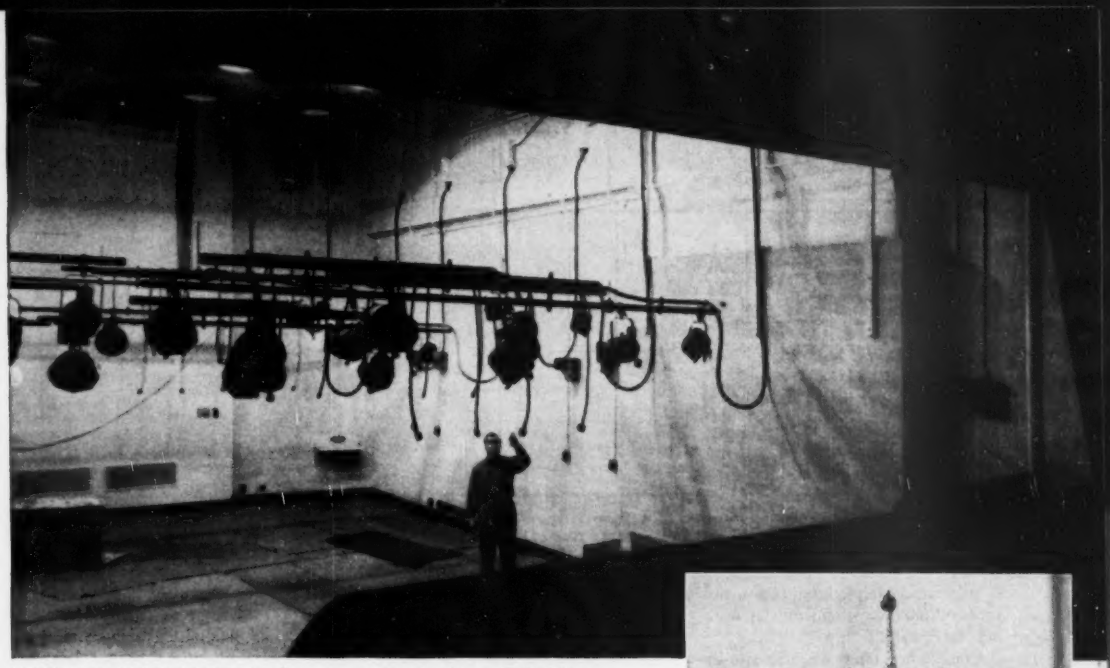
Air circuit breakers, with ratings properly coordinated with transformer capacities, give adequate interrupting capacity and isolate troubles in feeders. Oil fuse cutouts are interlocked to prevent opening with load on transformers.

Flexible layout permits easy, quick maintenance without interruption of power. System flexibility itself provides for addition of new loads, making it far less costly for the station to expand in the future. Grounded, metal-enclosed G-E load-center units, with noninflammable Pyranol* transformers assure maximum protection for operating personnel.

For further information on G-E engineered load centers, call your local G-E sales representative, or write for GEA-3592, General Electric Company, Schenectady 5, N. Y. 321-47

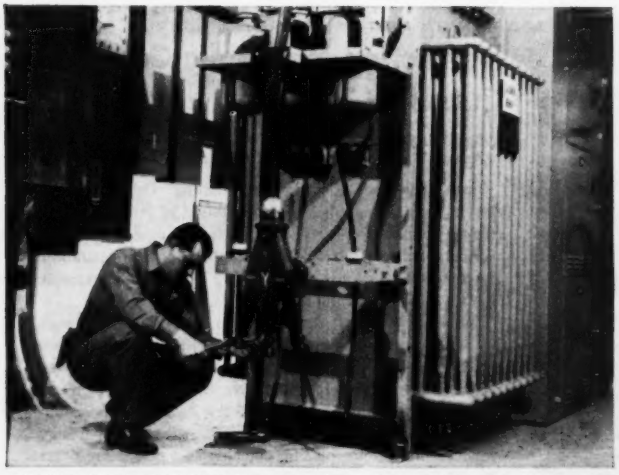
*Reg. Trademark of General Electric Co.

GENERAL ELECTRIC



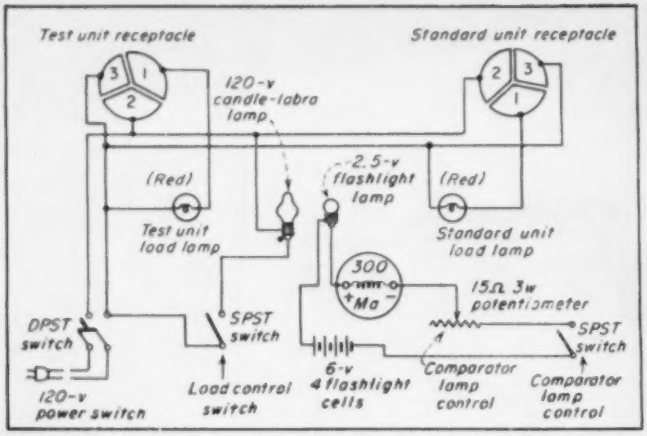
LIGHTS FOR TV PRODUCTION. Studio construction shot from WWJ-TV's control booth shows battery of lights necessary for televising. Lighting throughout the new station is fed from G-E engineered load centers.

G-E load-center system



CUTOUTS FOR PROTECTION. Engineer wires pothead of incoming high-voltage cable to cutouts on transformer of TV lighting breaker. Oil cutouts are interlocked, cannot be opened or closed with load on transformer.

PENOBSCOT BUILDING—Detroit's highest—houses all of WWJ-TV's transmitter equipment. TV antenna tops highest central portion. Here are transmitted programs originating in new studios powered by G-E load centers.



LIGHTPROOF TEST BOX allows photoelectric street lighting relays to be checked against standard relay. Test relays can be checked and adjusted within a few minutes each. A lamp of standard candle power is used only to check the relay designated as the standard

is turned on at full brightness. This turns off the indicating lamps by opening the relays.

Comparator lamp brightness is decreased by means of the potentiometer until standard relay closes, as indicated by its red lamp. Proper adjustment is made on test relay according to whether its indicating lamp came on before the standard relay.

Load control lamp is of value in making this adjustment because indicating lamps may be turned off by turning the load control lamp on; thus it is unnecessary to move the comparator lamp setting any great degree.

After adjustments are made, comparator lamp is turned up by increasing the current to indicate when the test relay will turn off as compared with the standard. This test is made only as a general check of the unit to assure that this operation falls within allowable factory tolerances. Milliammeter current is an indication of comparator lamp brightness. Reference marks on the dial may be used as a double check on proper relay turn-on and -off light levels.

Although used primarily in the laboratory, this test box may be installed in a truck and used in the field. Power cord can be plugged into the pole-mounted unit base from which the unit to be tested is removed. Field test follows same procedure.

PRECISION CONTROL is feature of hydraulic crane with retracting boom. It is used for many types of jobs, saves time and labor

Retracting Hydraulic Crane Cuts Job Time

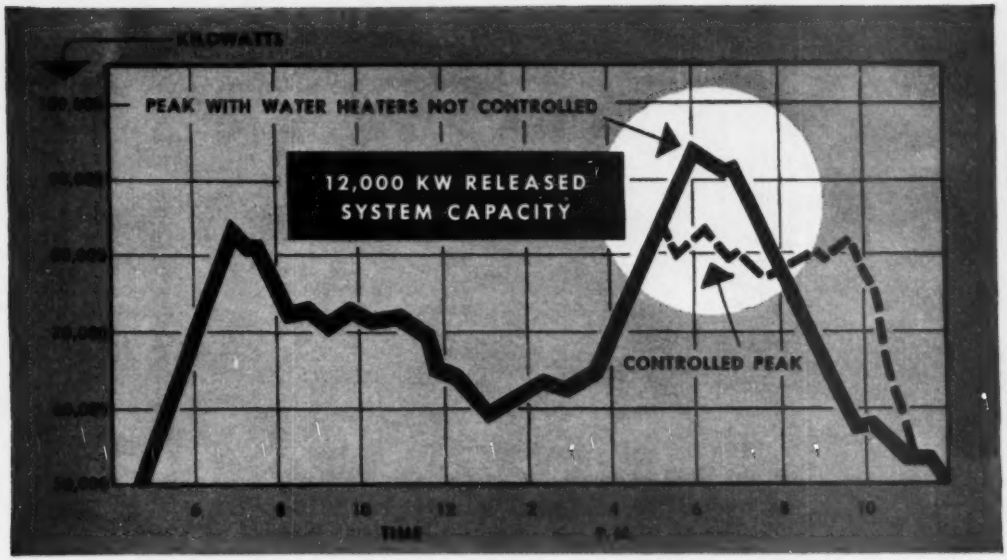
J. S. STRASBOURGER, Special Assistant to the Purchasing Agent, The Cleveland Electric Illuminating Co

The Cleveland Electric Illuminating Co has been carrying out a program of mechanization of operations. As a result numerous pieces of labor-saving equipment have been adapted to electric system construction and operation. The hydraulic crane with retracting boom is an example of what can be accomplished in this direction.

Time has been cut materially on every operation with this three-ton unit. Feature of the equipment is precision control which is made possible with hydraulic operation.

This crane is used for: changing bushings on high tension transformers and circuit breakers; erecting steel; hanging large transformers; work on public streets under trolley wires; pulling piling; placing cement; and numerous other jobs.

Maximum boom length is 30 ft plus an 11-ft extension. Minimum boom length is 15 ft. For traveling the boom retracts and lies on the truck cab.



TYPICAL SUBSTATION LOAD CURVE IN AREA USING 20,000 WATER HEATERS SHOWS RELEASED LOAD THROUGH USE OF OFF-PEAK CONTROL

Released Capacity with Off-Peak Control . . . Fact or Fantasy?

A major benefit of off-peak control lies in its ability to release the available kilowatts between peak load *with* control and peak load *without* control.

The electric water heater load is expected to more than double in the next eight years. In 1960 annual sales of electric water heater sales will be an estimated 1,800,000 and the total annual water heater load will be approximately 35 billion KW hours.

RELEASED POWER

The capacity released in the distribution system (by off-peak control) can absorb additional domestic load—created, during the control period, by electric ranges, automatic washing machines, and other appliances. Savings result in deferred investment for new capacity.

FOR EXAMPLE

Let's assume that there are 20,000 electric water heaters on a system. Multiply this number by 0.6 (the average KW demand per heater) and get the number of KW's released in the distribution system. In this case it's approximately 12,000 KW's. Apply this simple formula to your own system and see how much capacity off-peak control can release for you.

COST COMPARISONS

Industry figures for the last six years show that each kilowatt of installed capacity costs approximately $500.*

The diversified contribution of each water heater to the total load is approximately 0.6 KW. Therefore, each water heater accounts for 0.6 x $500—or $300 of installed capacity.

Contrast this with only $25–50 per water heater installation for off-peak control.

LARGE SAVINGS POSSIBLE

At a cost of $500 per kilowatt of new capacity, 12,000 KW of water heater load would cost approximately $6,000,000. Yet off-peak control makes it possible for new load to be added without necessitating new facilities to this extent.

SYSTEM STUDIES NEEDED

A thorough study of the economics of off-peak control (in the light of your own system) is needed if proper evaluation of individual requirements is to be made. Your General Electric Apparatus representative is prepared to discuss with you the possibilities which off-peak control may offer your own situation. For a more detailed report on the subject, write for bulletin GEA-5686 on the subject of off-peak control. Write to General Electric Company, Schenectady 5, N. Y. 603-143

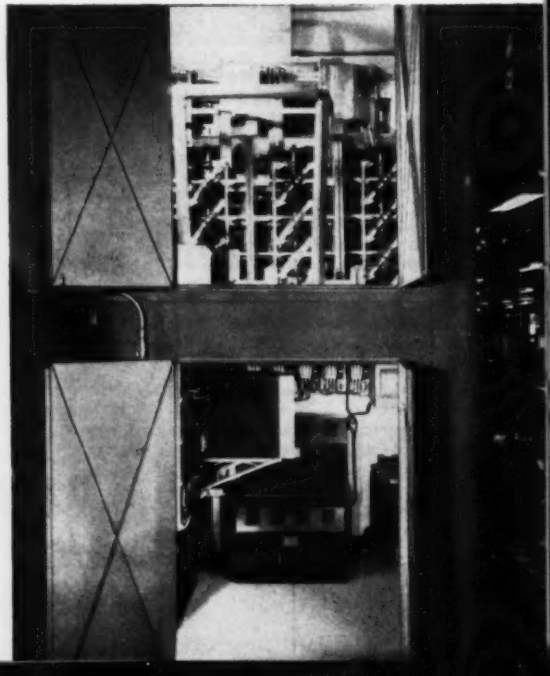
**ELECTRICAL WORLD, Statistical Issue, Jan., 1951.*

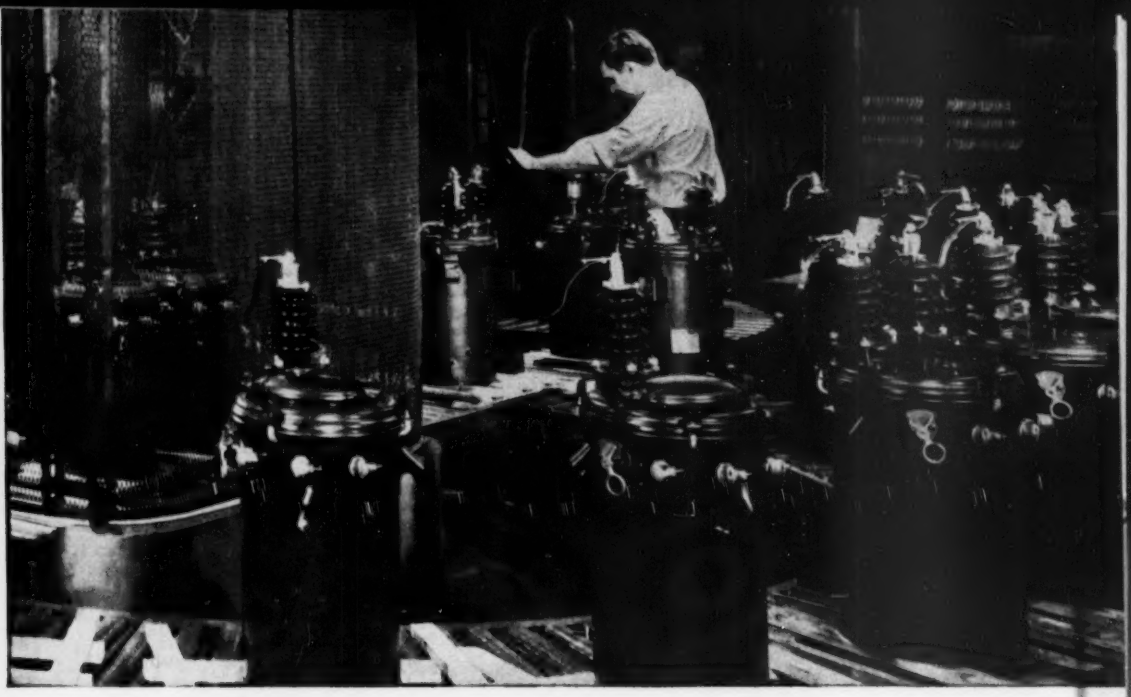
GENERAL ELECTRIC

Now...production-line impulse testing

AUTOMATIC DETECTION of even minor faults becomes a reality with new impulse-testing equipment which utilizes neutral-impedance method of fault detection for high-voltage windings.

INTERIOR VIEW of new impulse testing equipment showing impulse generator which performs sequences of operations and fault detection automatically . . . at production-line speed.





for G-E Spirakore* transformers

This new quality-control measure gives you added assurance of "extra years of service"

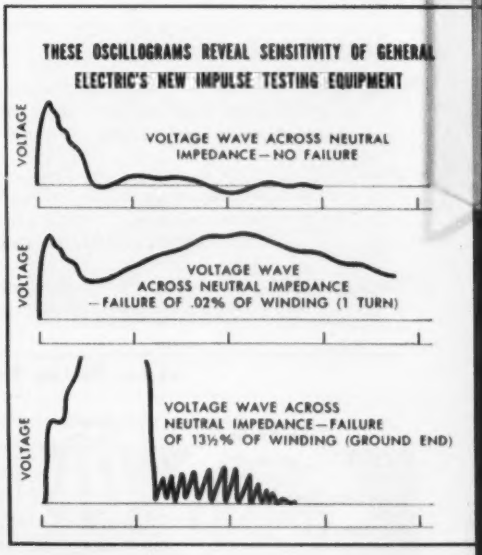
Impulse testing, more exacting than long-established, low-frequency testing procedures, is now being used by General Electric to make sure that your G-E Spirakore transformers will stand up under severe service conditions. More than 185,000 G-E transformers have already been tested right on the production line by this new method.

Production-line impulse testing assures transformers of sound manufacture and provides an additional check on over-all design. Both high- and low-voltage windings are tested without any protective equipment of any kind on the transformer. Any hidden weakness in the transformer is automatically detected and the unit rejected.

TEST RANGE. The equipment now in operation can test all single-phase distribution transformers 100 kva and below with high-voltage windings 18 kv and below, low-voltage windings 600 volts and below.

FOR MORE INFORMATION. GER-635, a reprint of a recent AIEE technical paper, will give you a complete description of this new impulse-testing technique. Ask your local G-E Apparatus sales representative for a copy, or write to Section 402-123, General Electric Company, Schenectady 5, New York.

*Registered trademark of the General Electric Company


THESE OSCILLOGRAMS REVEAL SENSITIVITY OF GENERAL ELECTRIC'S NEW IMPULSE TESTING EQUIPMENT
VOLTAGE
VOLTAGE WAVE ACROSS NEUTRAL IMPEDANCE—NO FAILURE
VOLTAGE
VOLTAGE WAVE ACROSS NEUTRAL IMPEDANCE —FAILURE OF .02% OF WINDING (1 TURN)
VOLTAGE
VOLTAGE WAVE ACROSS NEUTRAL IMPEDANCE—FAILURE OF 13½% OF WINDING (GROUND END)

GENERAL ELECTRIC

Determine Anchor Holding Power By Class of Soil

Anchor holding power is determined largely by the type of soil in which the anchor is placed. A guide for holding power is an adaptation from Distribution Standards of Central Power & Light Co

All anchors and rods are to be in line with the strain and to be so installed that approximately 6 in. of the rod remains out of the ground.

In earth known to be seasonally marshy or of low holding power the loads per down guy will be reduced to 50% of the values given in the table.

Soil Classifications Defined

Following classifications give consideration to both the soil condition and type; however, the moisture content is a predominating factor. Classes 3 to 8 are referred to in the table.

Class 1. Hard rock (solid)

Class 2. Shale, sandstone (solid or in adjacent layers)

Class 3. Hard, dry (hardpan usually found under a class 4 strata, resembling soft rock, requires use of digging bar)

Class 4. Crumbly, damp (usually clay predominates—insufficiently moist to pack into a ball when squeezing by hand—particles crumble off)

Class 5. Firm, moist (usually clay predominates other soils commonly present—when squeezed by hand will form into a firm ball. Moist soils in well-drained areas will fall into this classification)

Class 6. Plastic, wet (usually clay predominates as in class 5. Due to unfavorable moisture conditions such as areas subjected seasonally to heavy rainfall, sufficient water is present to penetrate the soil to appreciable depth and though the area is fairly well-drained, the soil during such seasons becomes plastic and when squeezed will readily assume any shape. This soil is not uncommon in fairly flat terrain)

Class 7. Loose, dry (found in arid regions usually sand or gravel predominates. Filled-in or built-up areas in dry regions fall into this class. As the term implies, there is very little bond to hold the particles together.) Loose, wet (same as loose dry for holding power. High in sand, gravel, or loam content—holding power at some seasons is good, but during rainy seasons absorbs excessive moisture readily with resultant loss of holding power. Predominant in poorly drained areas. This class also includes very soft, wet clay).

Class 8. Swamps and marshes (includes areas that are marshes only seasonally). Moist soils will vary in their classifications during the year due to changes in their moisture content. Worst condition should be estimated. Study and analysis of the many tests revealed that moisture content and its effect on the soil was a greater factor in determining ultimate soil anchor holding strengths than was a fine division of soils. Anchor holding powers determined on this basis were much more uniform than those based on fine divisions, of soil content.

Anchor Holding Powers in Various Classes of Ground

Type Anchor	Area Sq. In.	Anchor Holding Power, lb for various soil classifications					
		3	4	5	6	7	8
Log (6 ft x 8 in.)	576	73,500	62,000	49,000	39,500	30,000	.....
Plate	400	50,000	43,000	34,000	27,500	21,000	.....
Expanding	138	26,000	22,500	18,500	14,000	10,000	.....
Expanding	130	24,000	20,500	16,000	12,500	8,500	.....
Swamp (Screw)	176	.....	.....	.....	.....	.....	15,000
Standard (Screw)	78	.....	13,000	10,000	8,000	4,500	.....

NEW SG-4

115 Kv, two-pole high speed grounding switch mounted in the upright position. Blades are in the open position. Contacts will close within 15 cycles after the release coil is energized.

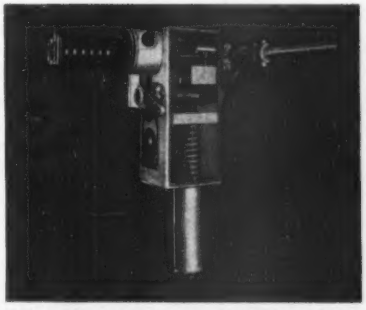
KEEP TRANSFORMER DAMAGE TO A MINIMUM by high speed grounding of line. The "SG-4" single-pole switch will close in 15 cycles after relays detect transformer fault. Slightly longer for multi-pole operation.

ELIMINATE EXPENSIVE PILOT WIRE OR CARRIER CURRENT EQUIPMENT to remote breaker. By grounding line, high speed relays at remote location can detect fault and trip breakers.

SIMPLE TO INSTALL. UNIT DESIGN MAKES INSTALLATION EASY. "SG-4" grounding switches are positive in action and are easily reset to open position either manually or automatically.

Aluminum blades have silver faced copper tips. When blades close, tips make high pressure contact with long contact shoe at top of insulator stack. Absorbers at both ends of blade prevent contact bounce and minimize shock on blade and insulator stack. Spring mechanism has sealed and permanently lubricated ball bearings on main shaft, needle bearings in low temperature grease on driving shaft and rollers. All links and levers are completely enclosed . . . all parts exposed to weather are bronze, aluminum or hot-dip galvanized steel.

Consult the Factory or Nearest District Office for Complete Information



The inspection plate has been removed from the trip-free operating mechanism of the "SG-4" to show the interior.

WHEN YOU WANT THE BEST IN HIGH VOLTAGE SWITCHING EQUIPMENT SPECIFY DELTA-STAR

DELTA-STAR ELECTRIC COMPANY

DIVISION OF H. K. PORTER COMPANY, INC.

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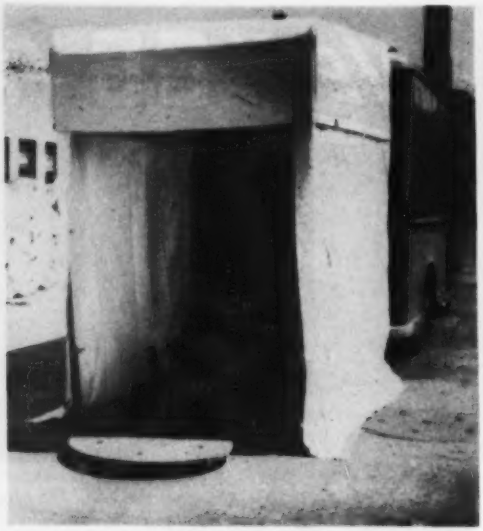


TWO MINUTE'S WORK assembles canopy, protects manhole and splicer from weather. Frame slides away into piping on roof

WOODEN CABINETS were used to determine best dimensions of steel bins for future trucks. Several week's field work decided interior

Utility Splicer's Truck Features Detachable Canopy

New design for a splicer's truck was based on suggestions of distribution department personnel and worked out under the supervision of Leo Grice, general foreman, Hartford Electric Light Co. A standard commercial truck body was equipped with ¾-in pipe frame attaching a canvas tent to the rear of the body. When the tent is set up it completely covers the manhole area, and when not in use the tent folds compactly for transport inside the truck. The frame nests into pipe supports on the truck roof.

Wooden cabinets inside the truck carry the tools and supplies, insuring protection against moisture not provided by external compartments. The cabinets were made of wood for the first truck so field service would determine the best spacing, dimensions and locations for the bins. Shelf sides or stops prevent equipment from sliding when truck is in motion.

Equipment includes a gasoline pump with 250-gpm capacity and a 3-in hose for pumping out manholes and transformer vaults. A ladder is hung inside by strap iron supports, as well as a fire extinguisher, first aid kit, rubber goods. Flashing roof lights on truck are battery operated, visible 50 to 75 ft. Two men normally operate the truck, can handle all underground splices from the conventional house service up to 27-kv feeders.

Thermal Relay Gives Overload Indication

J. F. BRUBAKER and **E. A. THOMPSON**
Westinghouse Electric Corp, Sharon, Pa.

An existing thermal overload relay is now equipped with an indicating dial. The combination is known as a "Thermal Load Indicating Relay." Advantages of such a combination over the basic relay are:

1. Provides visual indication of extent to which a power transformer is loaded, relative to zones of moderate and excessive loss of life.

2. A maximum indicator hand shows highest level of previous loads relative to zones of moderate and excessive loss of life.

3. Dial reads "percent thermal load" for reference purposes and simplifies estimation of permissable overloads.

4. Dial shows proximity of existing load to significant operating points of the thermal relay.

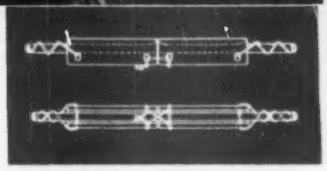
Aside from its utility in estimating the ability of a transformer to withstand continuous overloads safely, the dial is a potential aid to determining the approximate length of time a given overload may be carried without endangering a trip-out.

Usefulness of the present thermal overload relay in permitting safe loading up to the thermal capacity of the transformer is not to be discounted, but the addition of a dial makes the relay even more useful to the operator who desires to get the most out of his transformer.

Since thermal overload relays are able to evaluate automatically the effect of high temperatures on life of insulation as interpreted by the "ASA Guides for Loading Transformers," they are to be preferred as thermal load indicators over hot spot thermometers which leave all such interpretations up to the operator.

A black dial with yellow figures and letters shows continuously the operating position of the relay relative to the signal and trip points and gives a reference reading

LINEMAN—SPARE THAT TREE!



PINCO TREE INSULATORS provide maximum, permanent protection for tree, wire and service

Up until Pinco Tree Insulators were introduced, beautiful trees such as these majestic Eucalyptus were becoming daily casualties to ever-expanding power lines. Today, thanks to Pinco foresight and pioneering, Pinco Tree Insulators provide the answer to an old and troublesome problem—permitting utilities to string lines *safely* without marring the beauty of cherished landmarks.

The super-hard, super-smooth surfaces of Pinco Tree Insulators resist the abrasive action of trees, branches or other obstructions. And their mechanical strength is such that, on test, they withstand repeated side hammer-blows up to 100 inch pounds without failure! The porcelain itself . . . produced by the Pinco Wet Plastic Process, guarantees high dielectric quality.

In service, Pinco Tree Insulators have conclusively proved their superior efficiency, durability and economy. Many users state that they *save their original cost every year!* May we submit facts, figures and samples to prove this point to *you?*

THE PINCO TREE INSULATOR

is attached directly to the wire it protects . . . unaffected by the sway of limbs, remaining permanently in place. It may be used singly or in multiple; the diagram above shows the method of attaching two or more to the conductor.

PINCO INSULATORS

RIGHT ON THE JOB

THE PINCO TREE INSULATOR NO. 3600
for power and light primary and secondary, power and light services, etc. (cable up to 1" diameter) . . . is made in 12", 14" and 16" lengths. Other models are available for heavier or lighter service. U.S. Patent No. 2,361,109

The Porcelain Insulator Corporation
LIMA, NEW YORK

Sales Agents: Joslyn Mfg. & Supply Co.
Offices in Principal Cities

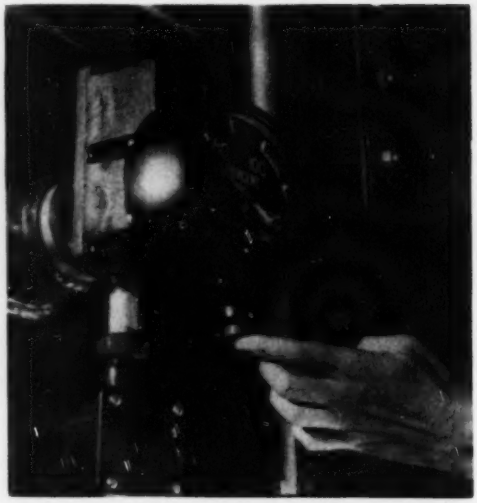
expressed in "percent thermal load." A red resettable maximum indicator registers highest postion of the load indicator since last reset.

On transformers in which the signal switch performs the function of initiating additional air blast or forced-cooling equipment, the word "signal" does not appear at the 100% scale mark. However, on all dials the word "trip" appears at the 110% scale mark, coincidental with the highest permissible thermal loading.

The yellow load-indicating pointer is actuated by a low-torque gear amplification from the relay operating shaft so that its deflection is directly proportional to the angular movement of the spiral bimetal due to changes in temperature in the transformer windings. The maximum pointer remains always in the position of greatest deflection of the indicating pointer. The indicator shaft is directly coupled to the gear drive shaft by a slip coupling, enabling easy removal of the relay cover for inspection or adjustment of the internal mechanism.

Provision has been made to adjust the angular position of the indicating needle relative to the position of the driving mechanism for a given temperature. This assures coincidence of the dial markings with the various switch operating temperatures that may be selected.

The trip and signal points carry the same interpretation on the dial that the corresponding relay contacts have always carried, namely, that these points represent the upper and lower limits of the zone of moderate loss of life in a transformer. When the upper limit is reached, the unit should be tripped off the line. The inclusion of the trip point on the face of the dial affords a means of checking whether there is imminent danger of a trip-out.



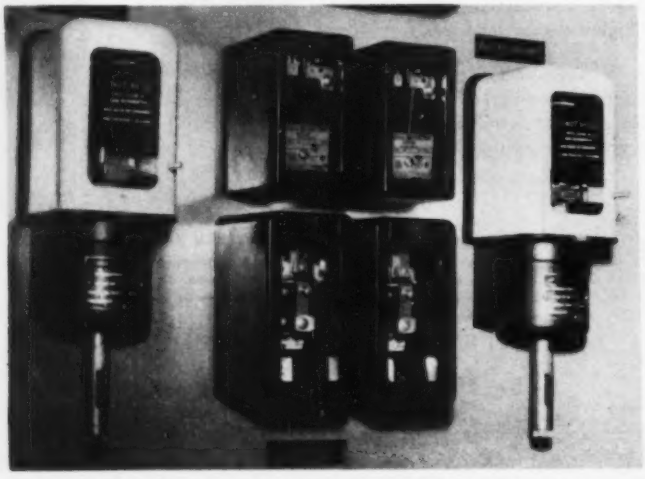
INDICATING RELAY mounted on power transformer. Dial attachment to present thermal overload relay permits personnel to see how rapidly relay is approaching or receding from signal and trip points

If one does not choose to use the tripping feature of the relay, the dial at least indicates the moment that point is reached when the tripping contact normally would close. Any further advance of the pointer indicates excessive loss of life.

Colors Label One-Shot Bus Relays For System Safety

F. W. **CORNETET,** Senior Engineer, Indiana & Michigan Electric Co, South Bend, Indiana

Where two or more relays of the same type are used for different functions, conspicuous identification has been found necessary so that personnel will stop and think before resetting the relays.



ONE-SHOT RELAY CASES sprayed distinctive yellow and labelled with warning

For our one-shot bus-differential relay installation, Dunco or type PAA relays are used to transfer the bus-differential detector-relay trip circuit. This circuit is initially connected to trip a self-reset auxiliary relay so that the second fault will operate an auxiliary lockout relay which can be reset only by hand. The Dunco and PAA relays are also used for other functions in control circuits. Type PAA is being used extensively in carrier-current installations. Although the external appearance of all PAA's is the same, those used in "one-shot" schemes differ in their operation in that they latch mechanically when operated and the reset button is used to reset both the relay and the target. All other PAA's are self-reset and their reset buttons are used only for resetting the targets.

Hence a premature resetting of the "one-shot" relay following clearance of a temporary bus fault and successful restoration of service would result

A Glance tells you it's Overloaded

Read How the *Thermalite* Indicator Can Save You Money in Transformer Protection and Utilization in Any Season . . . for Any Climate

WHEN THE BRILLIANT SIGNAL LIGHT of the *Thermalite* overload indicator flashes on, you can tell — at a glance — that your distribution transformer is overloaded. There is no interruption of service. Time-saving visual detection like this can save you hundreds of man-hours on costly surveys. It will help to eliminate transformer burnouts and service interruptions.

Important Advantages Save Money

Simple in operation . . . the warning light is actuated by a thermal device in the top oil. The light snaps on during excessive overload periods and remains on until turned off by an external handle.

The *Thermalite* indicator will stretch the dollars you spend for transformer protection. It's low in original cost, dependable and requires no maintenance. It is engineered, calibrated and installed at the factory.

Learn more about this visual, inexpensive way of detecting transformer overloads by calling your nearby A-C sales representative or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3793

Thermalite is an Allis-Chalmers trademark.

The Thermalite overload indicator is available on distribution transformers 100 kva and smaller, 15 kv and below.

ALLIS-CHALMERS

NO "FIRE-DRILL" NEEDED with THIS EXTINGUISHER

It's a Randolph!

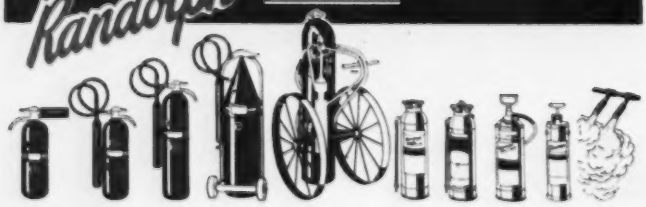
One glance tells you just how the Randolph operates—no instructions, no explanations necessary! That's why *anybody* can get a Randolph into action fast! No valves to turn, no nozzles to adjust; just point and press your thumb and Randolph's cloud of snowy CO_2 kills fire instantly!

Non-damaging Randolph CO_2 evaporates without a trace, is non-toxic, won't conduct electricity, deteriorate or freeze. And *all* Randolph Models are Underwriters' Approved.

A COMPLETE LINE OF EXTINGUISHERS AND AUTOMATIC SYSTEMS

Learn how Randolph gives your plant panic-proof, split-second protection against flammable liquid, electrical and other hard-to-handle fires! Write Randolph Laboratories, Inc., 4 E. Kinzie St., Chicago 11, Illinois.

Randolph SIMPLIFIED FIRE EQUIPMENT



in an extra test being made if the fault later developed into a permanent case of trouble.

The following measures were devised for identification, as shown by the accompanying illustration:

1. Covers of the "one-shot" PAA relays were sprayed with bright yellow enamel to distinguish them readily from PAA relays having other functions. The latter type have the usual black covers.

2. Black and white plastic nameplates, 2 in. by 2 in., were cemented to the glass windows of the "one-shot" PAA relays in such a position as not to obscure the targets. These nameplates bear the instruction: "Do Not Reset Until Cause of Bus Differential Operation Has Been Determined and Properly Cleared."

3. Similar instruction nameplates were cemented to the glass covers of Dunco "one-shot" relays.

Tractor Relocates Tower On 69-kv Line

PASSING H-FRAME LINE, wires for that circuit had been lowered to ground

When system developments required relocation of several spans of a 69-kv tower line of the Houston Lighting & Power Co several factors prompted the moving of the towers rather than rebuilding. The job would cost less if towers were moved and it could be done more quickly due to the problem of getting steel.

The new right of way was some distance from the old and a drainage canal intervened. Also an H-frame line was between the existing tower line and its new location. Towers were 72 ft high and weighed 5,500 lb.

A tractor picked up the towers,

BLACKBURN *Copper-Bonded* GROUND ROD

the Underground Story . . .

. . . ON LASTING PROTECTION!

It's completely covered with a heavy copper sheath, molecularly bonded to the steel core for permanent protection.

It has an extra-rigid, strong steel core which will not bend on driving.

Its copper sheath is cold-rolled, hard, and scar-resisting, for driving in rocky soil.

It's produced in the middle west, strategically located for quick delivery to all parts of the United States.

Stocked by Leading Wholesalers

JASPER BLACKBURN CORPORATION

35 Madison St., St. Louis 6, Missouri Phone CEntral 3007

Distributed on the West Coast by KORTICK Mfg. Co.

DOW CORNING
SILICONES

make motors last longer

Paid for itself 30 times in 2 years

Tough operating conditions are the order of the day for the 5 hp hot-ingot conveyor motor at The Infield Metals Corporation in Waterbury, Conn. Jogged on a 20-second cycle, it never gets up to speed. An unending procession of freshly-poured ingots at 600° to 2100° F passes within a few feet of it. The quenching system keeps it enveloped in clouds of steam.

The motor used to fail at least every 3 weeks. Rewinding with Class A insulation cost about $109. Down time and lost production expenses were about the same.

Two years ago the motor was rewound by the Electric Motor Repair Company of Waterbury with Dow Corning Silicone (Class H) Insulation. The initial cost was higher—approximately $235—but the motor has not failed since. Based on the 3-week service life of Class A, that means Class H has paid for itself over 30 times, saved $3471 in rewind costs alone.

That kind of performance in thousands of installations has proved that Dow Corning Silicone Insulation has 10 to 100 times the life expectancy of the next best class of insulating materials; increases the power pound ratio in electrical equipment by as much as 50%.

CUT HIGH TEMPERATURE BEARING FAILURE WITH DOW CORNING 44 SILICONE GREASE

In open and single shielded bearings designed for high temperature operation, Dow Corning 44 Silicone Grease has 8 to 10 times the life expectancy of conventional greases. It gives lifetime lubrication in permanently sealed bearings.

mail this coupon *Today*

Dow Corning Corp., AY-22-A, Midland, Mich.
Please send me:
- ☐ Catalog of Class H Insulating Materials.
- ☐ List of Class H motor repair shops.
- ☐ Data on Silicone Grease for motor bearings.
- ☐ 32-page booklet entitled "What's A Silicone?"

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ON THE MOVE, tractor progresses slowly

and moved them slowly to the new right of way. The tractor was equipped with a boom long enough to reach above the tower's center of gravity.

Tractor moved past H-frame line after conductors on this line had been lowered to the ground and protected against damage, and crossed the temporary bridge constructed over drainage canal.

Emergency Measures Keep 35,000-kw Unit Operating

Six days after the third 35,000-kw generating unit at Southwestern Gas and Electric Company's Knox Lee power plant was cut in service, a 500-hp motor on the fan burned out.

That was on Sunday morning, June 29. The unit was back in service Monday night, June 30, although operating at reduced capacity.

Burned out was a 500-hp, 2,300-v, 3600-rpm motor. Southwestern Gas & Electric borrowed a 300-hp, 440-v, 3600-rpm motor from the Lone Star Steel Company nearby. It was possible to supply the different voltage from the power plant's Unit Number 1 440-v indoor sub-station.

The 300-hp motor was adapted to the foundation by building a steel framework that would fit the anchor bolts in the concrete foundation and bolting the motor to the steel framework. A flexible coupling was reworked in the company's maintenance shop to fit the shaft on the 300-hp motor.

The 30,000-kw (name-plate rating) generating unit has a normal capacity of 35,000 kw net. With the improvised 300-hp motor, it was possible to get about 26,000 kw net from the

- Conductor doesn't have to be centered for accuracy, (toroidal wound transformer)
- Pocket-size, belt-mounting
- Covers 9 ranges
- Probe jaws completely insulated
- Test lead plug insulates itself when removed from meter
- No-rim window floods scale with light

only
AMPROBE
has these features!

AMPROBE "600"
0-15/30/60/150/300/600 amps A-C
0-150/300/600 volts A-C
$59.50 complete with cowhide case and voltage test leads

AMPROBE "1200"
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$67.50 complete

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to 300 amps A-C
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Measures current instantly without interrupting service

PYRAMID INSTRUMENT CORP., LYNBROOK, N. Y.
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AMPROBE®

the only pocket-size snap-around volt-ammeter

WRITE TODAY:

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Send Bulletins describing

☐ Amprobe Models 600 & 1200

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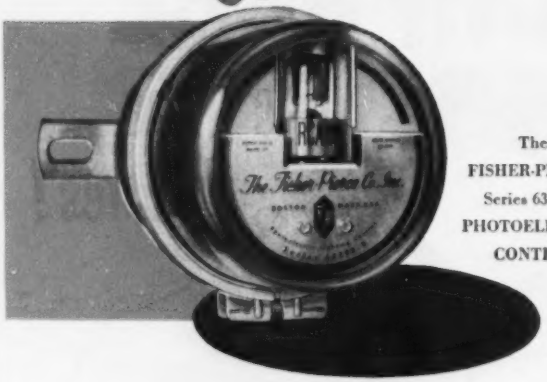
for positive control of street lighting



The FISHER-PIERCE Series 63300B PHOTOELECTRIC CONTROL

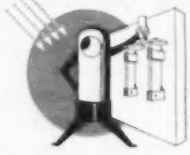
PHOTOELECTRIC CONTROL means the added *safety* of street lighting *when it is needed* — regardless of time of day, season, climate or weather conditions. Control is fully automatic. Even after temporary line power failures the control operates correctly with no need for manual resetting.

FISHER-PIERCE Photoelectric Controls for street lighting have proven themselves in over 35,000 installations made by more than 700 electric utilities.

The electronic circuit of the Series 63300B control provides dependability made possible by over seven years of practical experience. Amplifier tubes consistently have a life of more than 20,000 hours. Other components have much longer life. Units are rated 2500 V.rms hipot to give maximum resistance to the effects of lightning transients. The built-in contactor is conservatively rated to handle a 3000 watt lighting load. The unit has Standard meter socket plug-in construction with cross-arm mounting bracket which gives great installation flexibility.

The control itself gives *truly* economical (*low* purchase cost, *low* installation cost and *low* maintenance cost) and effective service backed by an extensive engineering service organization field experienced in street light control application.

Write for Bulletin 63300B.



The FISHER-PIERCE CO., Inc.
82 Pearl St., So. Braintree, Boston 85, Mass.

EXPORT: PHILIPS EXPORT CORP. 100 E. 42nd STREET NEW YORK 17, N.Y.

IN CANADA: NORTHERN ELECTRIC CO., Ltd.

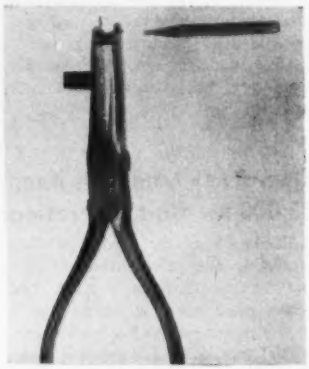
unit. Operators were able to regulate the load on this 300-hp motor because it was connected to the fan through a hydraulic coupling.

The 500-hp motor was rewound, returned to the job and placed back in service Sunday, July 6, one week after it burned out.

Plier-Jig Adjusts Springs on RW-2 Register

E. H. TYSON, Superintendent of Meters, Pennsylvania Power & Light Co, Hazelton, Pa.

A plier-jig combination tool has been developed for holding and adjusting the small spring which controls the action of the push rod of a RW-2 demand register. With this device the operator can see how much

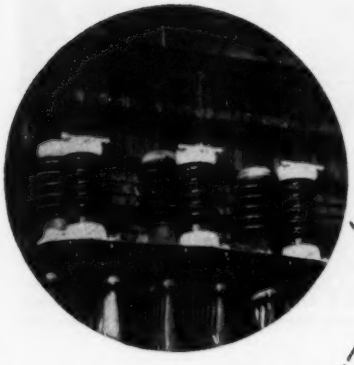


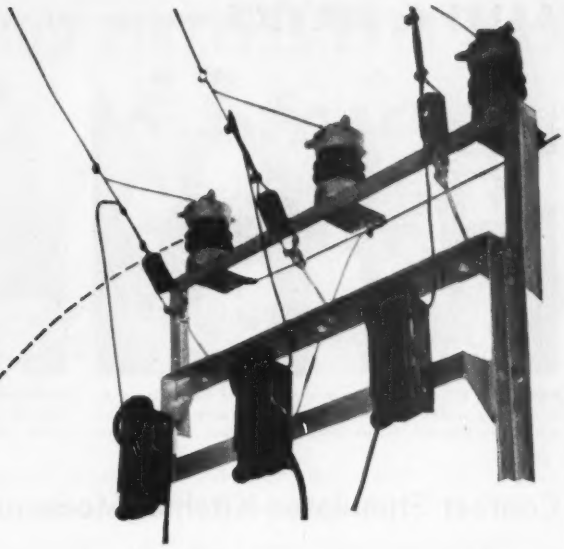
PLIER-JIG with 2-in. bending lever attached was developed to hold and to adjust push rod springs on RW-2 demand register

adjustment is being made. There is no danger of damaging the ends of the spring as when making the adjustment with conventional pliers.

The tool consists of a pair of long-nosed pliers with three pins in one jaw and a 2-in. rod or bending lever of brass and steel which is carried clipped to the same jaw. The lever has a hole drilled in the steel end so that it can be slipped over the end of the spring.

To operate the plier-jig, the spring is placed over the larger of the three pins with the end of the spring between the two smaller pins. The supporting pin is shorter than the spring, thus allowing compression of the spring when the jaws are closed as shown in the illustration. Adjustments with this jig are much easier.





PERFORMANCE and PRICE

of Thorex Arresters Fills Long-Felt Need in Single-Customer Substations

Lightning protection of single-customer substations was, at one time, necessarily a compromise. Arresters of a grade associated with central station protection could not be justified by the class of load. Arresters whose price adapted them to the application were inadequate to provide the dependability of service required by most industrial customers.

For the first time, O-B Thorex lightning arresters offer you the right combination for this common problem. An exceptionally high grade of protective performance is now available at an attractive "popular" price.

Investigate Thorex arresters for your single-customer substations -- you will find they fill a long-felt need.

Ohio Brass

4241-H

MANSFIELD OHIO, U.S.A.

WINNERS of $50 and $100 awards were guests of Union Electric Co At right, top winners show entries to sales department personnel. Left to right, Herbert Silk, Soldan Blewett High School, St. Louis; Ann Schlenther, St Peter's High, St Charles, Mo; Daryl Reitz, Mehlville High, St Louis; Ruth A. Shank, director of home economics; Robert L. Coe, residential sales manager; and M. E. Skinner, vice president

Contest Stimulates Kitchen Modernization Interest

3,300 registrations from 100 high schools result in 1,300 entries from 87 schools. Prizes totaling $5,000 awarded. Sparks interest of students, teachers, schools and homes.

RUTH A. SHANK, Director of Home Economics, Union Electric Co of Missouri

More than 3,300 registrations from 100 high schools with 1,300 contest entries from 87 high schools were proof of the interest stimulated in Union Electric Company's "Our Family Kitchen" contest. The program was planned with a view to maximum interest from the most people.

Prizes totaling $5,000 were offered. They included five—$100 awards, 10—$50 awards and 150—$10 awards, for students. For each student award there was a duplicate award made to the school or class project. In this way interest of teachers was stimulated and recognition was given to the teachers.

Most of the awards were made in general assemblies. Every school requested entries be returned after judging.

Many kitchen planning exhibits of the miniature kitchens were features of closing of school activities. Many of the awards made to class projects were used to purchase new appliances for home economics laboratories or blue printing equipment for a home planning class. One school used award money to purchase kitchen planning miniatures for teaching future classes. Two schools requested plans for modernization of their home economics laboratories. These projects were to be carried out during the summer vacation.

To launch the program, individual presentations were made by the home economists to the principals and subject teachers in 120 high schools.

Planning Contest . . . The contest was planned as a teaching unit that could be adapted to industrial arts home planning, family relations or home problems courses. Contest materials included registration blanks; a brochure of the fundamentals of kitchen planning; entry blanks with questions for essential information students needed for planning kitchens; and kitchen-planning kits with cut-outs of appliances and cabinets to make the model.

Home economists scheduled kitchen planning lectures and demonstrations for their classes as students registered for the contest. For these demonstrations model kitchens were used. The EEI film "The Constant Bride," and illustrated charts were also shown to explain work-center planning and how to use the contest materials.

Beautiful art work showed up among contest entries. There were kitchens with hand decorated designs; accessories moulded from colored clay; and wall clocks and radios made in home arts classes.

Electrical wiring and lighting controls seemed to be of special interest to the boys. Although girls were in the majority for the final awards, 35 of the winning entries were by high-school boys.

Lighting the Way To Learning

"Lighting the Way to Learning" is a 20-minute, 16mm, color-sound, non-technical film for presenting to school board, P.T.A. and comparable groups the facts about bad seeing conditions in many schools. The film shows what was done about it in the school where young "Teddy Roberts" was slipping in grades and morale. The story of the bewildered boy and the challenge which he set up in the mind of the school principal, and how the bad conditions were corrected is entirely credible throughout because it is held within limits of actualities familiar to anyone who knows schools.

The film teaches the ABCs of brightness and of glare control in both day and artificial light. It stresses the necessity of bringing the entire interior into harmony. Therefore, it offers far more than a trite concept that better light automatically means better sight.

The interior scenes were taken in schools in various parts of the coun-

FINEST DISTRIBUTION PINTYPES EVER MADE

THANKS TO VICTOR PURIFIED PORCELAIN!

There are many reasons why power men are partial to Victor Pintype insulators . . . but the biggest is that they're made of VICTOR *PURIFIED* PORCELAIN— finest insulator porcelain ever made! *PURIFIED* PORCELAIN gives these pintypes a strength and resistance to impact that are unequalled. Puncture values are higher. Uniformity, hardness, density and durability are greater than ever before!

AND, remember, every Victor Pintype is electrically tested before shipment.

***The result*—dependability under *all* service conditions!**

VICTOR INSULATORS, INC., VICTOR, N. Y.

VICTOR NO. 5
DISTRIBUTION PINTYPE

ADVANCE DESIGN FOR
ALUMINUM CONDUCTORS

For the larger aluminum conductors being used today, Victor has increased wire groove sizes on distribution pintypes. For complete engineering data, write today for Bulletin No. 4.

Specify
VICTOR
PINTYPE INSULATORS

try and Nela Park receives credit, both title-wise and in one of the sequences, for its contributions to "Lighting the Way." The film was prepared by the F. W. Wakefield Brass Co, Vermilion, Ohio, for electric utilities to show at almost any sort of non-technical meeting.

Dimming of F-Lamps Shown at IES Meeting

A system for dimming fluorescent lamps with a turn of a knob was demonstrated at the recent technical conference of the Illuminating Engineering Society in Chicago. Developed by General Electric lighting engineers at Nela Park, Cleveland, the system consists of a dimming control unit and matching ballast.

Although equipment is still in the design stage, early release for production is anticipated. It will be available with either conventional 40w pre-heat lamp, or the 40w "Rapid-Start" fluorescents.

Engineers expect the dimming feature to find favor in such places as theaters, auditoriums, schools, display rooms, stores, hotels, night clubs, restaurants, television studios, show windows, and signs.

How Much For the Old Set?

Publication of the first television set trade-in guide, the 1953 NARDA TV Blue Book, has been announced by the National Appliance Guide Co, 2132 Fordem Ave, Madison 1, Wisconsin. The manual, scheduled for mid-November distribution, will provide authentic, detailed, up-to-the-minute information about all popular TV sets of over 30 leading manufacturers, covering models produced from 1947 through 1952. The annual guide will tell the dealer how to evaluate trade-ins, how to service them, and how to re-sell them to his and the customer's mutual satisfaction.

EEI Develops New Sales Training Course

Six-lesson Appliance Sales Training Course to assist electric light and power companies and appliance dealers in fostering good sales techniques among personnel has been prepared by the Sales Personnel and Training Committee of Edison Electric Institute.

Materials for instruction include six 100-frame sound slide films, six trailer discussion films, six leaders' guides, and six manuals. Described are basic selling techniques, methods of seeking out prospects, answering objections, demonstrations, and how to close out sales.

The course is available for $250 for the complete package, with a 10% additional charge for non-members of EEI.

Aiming at Selected Market Sells Heaters

Selective marketing of electric water heaters paid off in a pilot sales campaign conducted by Detroit Edison this summer.

Groundwork for the promotion was laid by choosing from among various population and income groups 5,000 electric range users who did not have electric heaters. Each of them received a series of four cards and one broadside over a two-week period. Shortly thereafter an Edison salesman called to clinch the sale.

Of the 5,000 aimed at, utility men got to talk to 4,200. Two hundred of them were sold, an average exceeding one sale per salesman per day. In addition, many future prospects were lined up. A similar drive will be undertaken this fall in behalf of dealers.

Electric Bedding Campaign Starts

Based on the advertising themes "Four and a half million people sleep under electric bedding" and "What's a good night's sleep worth to you," the Electric Association, Chicago, has launched its third annual electric bedding campaign.

Distributors and manufacturers, as well as Commonwealth Edison Co and Public Service Co of Northern Illinois are cooperating in the drive that will continue through the Christmas gift season. In addition to advertising, funds were appropriated for a Mystery Shopper campaign and dealer displays and promotion materials.

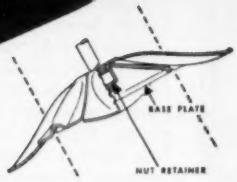
As in 1951, an Electric Bedding Institute has been set up on the first floor of the Commonwealth Edison Co building where all participating brand name products are being displayed.

You Need Wattage to Melt Snow

If you want to do effective cleaning of your sidewalks, you must put the wattage into the job. This is proven by the above pictures of tests worked on recently by Western Massachusetts Electric Co. Top photo shows the heating elements installed in three sections of 30, 20, and 15w density per sq ft. The cable was placed between two layers of concrete 1½ in. below the surface, and control equipment was led from the cellar of the house. Lower picture was taken after a 3-in. snowfall hit the Westhampton, Mass, area bringing with it below freezing temperature. High wattage section (foreground) performed its melting job to perfection at an estimated cost of 20 cents. Patches of snow remained in lower wattage sections in background.

Tip for better anchoring . . .

Build lines to stay with the CHANCE 8-Way!



Not two... Not four... but EIGHT blades

for better load distribution

This unique all-steel expanding anchor gives you "TWO four-way anchors in ONE"—Eight blades that expand into undisturbed earth *all the way around* the hole, to give more complete load distribution than any other type of expanding anchor. There is no wasted area between blades.

The Chance 8-way is extremely simple in construction. It has no expanding arms or mechanical moving parts to jam or bind during expansion. There are no bolts to cut—the holding wires shear with a single blow of the expanding bar. The eight ribbed blades cut quickly into the solid earth and expand to form a cone-shaped square.

These are reasons why Chance 8-way Anchors are preferred by many large companies who thoroughly test and prove to themselves before they buy. Another big reason is the low price of the Chance 8-way that helps to answer the problem of constantly rising line construction costs.

Get full information today—consult your Chance Catalog—compare the features, compare the costs —order from your regular supplier.

Chance 8-way Anchors are available in a complete range of sizes from 60 to 200 square inches in area for distribution or transmission line guying.

You know it's RIGHT when you specify CHANCE

ABC INDUSTRIES

A·B·CHANCE CO·

CENTRALIA, MISSOURI
SAN FRANCISCO, CALIFORNIA

ANCHORS • GUYING FIXTURES • LINE CONSTRUCTION TOOLS • CONDUCTOR CLAMPS
GROUNDING EQUIPMENT • HOT LINE TOOLS • HIGH VOLTAGE SWITCHES • CUTOUTS

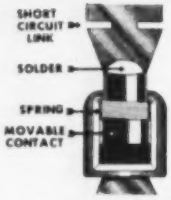
DID YOU KNOW?

More than 15,000,000 Chance Anchors have been put in service—*more than all other makes combined!*

* * *

The company that makes the most anchors should know the most about them. That's why you're *right* when you specify CHANCE.

C52-15



When the tripping temperature of the Trion's Therm-A-Trip melts the contact-release, the movable contact driven by its heavy spring opens the circuit.

It takes a long time to heat a block of copper hot enough to melt a piece of solder attached to it. Trion's patented contact-release works in the same way. The solder of its contact-release melts only when the copper mass of its movable contact becomes sufficiently hot.

Trion's Therm-A-Trip element of solid copper is matched to the thermal capacity of the motor or transformer it protects.

Trion blows only when temperatures rise due to "sustained" over-currents. It has the longest safe time-delay of any fuse — five times longer than ordinary fuses. Thus does it give fullest protection and prevent many unnecessary shut-downs.

Trion PROTECTS 3 WAYS

1 *Short Circuit Protection:*
Instantaneous cut-off on a short circuit. The short circuit link blows instantly.

2 *Overload Protection:*
THERM-A-TRIP's positive matched heat control — with the longest safe time-lag of any overload protective device — provides safe starting for motors, and protection from single phasing.

3 *Cooling:*
Trion's lower watt loss makes it the coolest operating fuse of any type. Trion prevents overheating of switches and fuse clips.

A TRION FOR EVERY CIRCUIT. Trions are available in 141 Standard Sizes ranging from 1 to 600 amps for both 250 and 600 Volt circuits. Other sizes for these same voltages range from 1/10 amp to 9 amps. Midget Sizes (3/8" dia. by 1 1/2" long) vary from 1/10 amp to 10 amps. ASK FOR TRION OR WRITE FOR FREE TRION BULLETIN #506-A TODAY.

Trion – "Hands At The Switch"

THE **CHASE-SHAWMUT CO.**
370 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

Cleveland Utility Explains Electric House Heating

What is electric glass panel heating? What does it require for satisfaction of the user? What does it cost? What is its future?

These questions are asked and answered in particular reference to customers of the Cleveland Electric Illuminating Co in a 4-page, letter-size, folder recently put out by the company.

Hundreds of inquiries about panel heating are received by the company every month. The folder was prepared to meet those requests for information. The print order was 15,000 copies. Each employee received one so that he or she could answer questions informedly. Quantities were delivered to manufacturers of panels and their representatives in the company's service area for handing to prospects. There was no general distribution to customers of the company. The piece is used only for response to inquiries.

CEI now has about 350 users of panel heating among its residential customers. A continuing survey is being made among these installations and it was from the survey work sheets that data on costs in the folder were taken. The folder emphasizes strongly the necessity for adequate thermal insulation in homes using electric heat. This necessity is pointed up by the cost data.

In a well-insulated six-room house of approximately 10,100 cubic feet, with nine 1000-w panels heating cost for a year was $194 or $21.60 per panel. But for a smaller (6,806 cu ft) six-room house, inadequately insulated and with ten 1000-w panels, the annual cost was $274, or $27.40 per panel. The lowest cost cited per panel is $12.60 and the highest $30.50 for an average of $22.70. The figures were obtained from the work sheets of the utility's representatives.

Final paragraph on the last page of the folder reads:

"If you are considering electric glass panels for your home, we recommend that you contact a representative of our residential sales department. He will be glad to answer your questions, help you plan your installation and make suggestions that will assure you maximum heat efficiency, minimum operating costs."

Simple as 1-2-3 to Install...

FARGO

"VISE TYPE" CONNECTORS

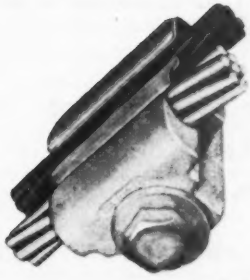
THE "5000 SERIES" FOR COPPER CONNECTIONS: This is Fargo's Standard Connector—obtainable in bronze or plated bronze. Vise-type design and one-piece construction make installations fast and easy. Available for #8 sol. to, 1000 MCM.

THE "7000 SERIES" HEAVY-DUTY CONNECTOR: This series is designed with a heavy spacer bar and wide contact areas of bronze, aluminum, or aluminum with bimetal inserts for "like metal" contact. Available for #6 sol. to 1,000 MCM.

THE "9000 SERIES" FOR ALUMINUM-TO-ALUMINUM OR ALUMINUM-TO-COPPER: Available in 4 types: type 1—for aluminum-to-aluminum—and type 2—for aluminum to copper—are used for smaller wire sizes, up to and including 4 ACSR. Type 3—for aluminum-to-aluminum—and type 4—for aluminum to copper—are used for large wire sizes, above 4 ACSR.

THE "5000 SERIES"

THE "7000 SERIES"



THE "9000 SERIES"

1st. HOOK ON RUN

2nd. INSERT TAP

3rd. TIGHTEN BOLT

FARGO

Manufactured by

FARGO MFG. COMPANY, INC.

Poughkeepsie, N.Y.

Distributed by

LINE MATERIAL COMPANY

(A McGraw Electric Company Division)

Milwaukee, Wisconsin

Unique Immersion Assembly Heats 12 Tanks

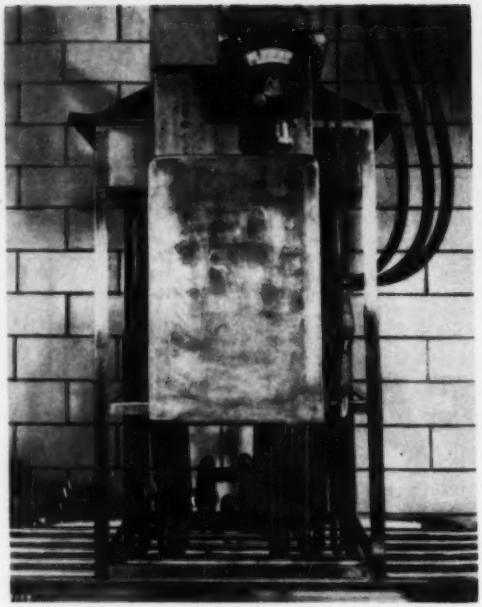
A. D. SPILLMAN, Supervisor, Industrial Applications Section, Market Studies & Service Division, Philadelphia Electric Co

Textile solutions are heated efficiently to required processing temperatures by means of a unique portable electric heater assembly at the Columbia Silk Throwing Co, Bloomsburg, Pa.

This portable assembly, having a connected load of 60 kw, can heat any one of 12 stainless steel tanks to a predetermined temperature. After one tank is heated the assembly is raised by means of an electric hoist and moved on a monorail system to the next tank where the heating cycle is repeated. A float valve mounted in a box prevents current being turned on until the entire unit is immersed.

The alloy sheath heaters and the stainless steel tanks resist the chemical action of the textile soaking solutions used and corrosion is eliminated. The solutions are heated to the desired temperature without any dilution such as was experienced previously when live steam was injected into the solutions.

Steam piping to the several tanks is eliminated and the entire volume of the tank is available for immersing silk textiles. Heat radiation and steam leaks from steam lines are eliminated—and more comfortable working conditions are maintained.



PORTABLE HEATER heats any one of 12 stainless steel tanks. Alloy sheath heaters resist chemical action and corrosion is eliminated

After six months' operation a second unit was ordered by this same customer for another one of his plants—another indication of complete satisfaction with equipment.

Electric Melting Pot Saves Lead

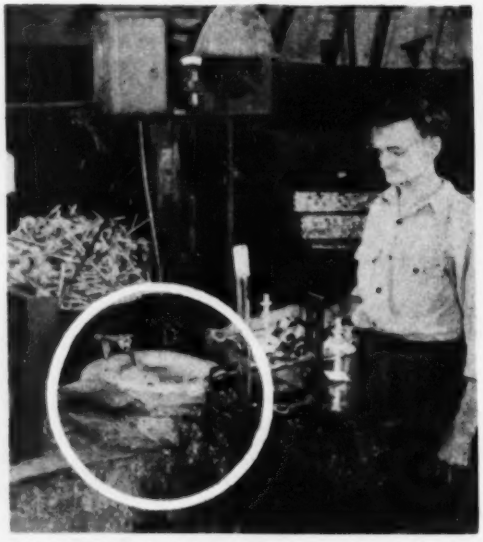
R. H. HARROD, Duquesne Light Co, Pittsburgh, Pa.

A 3-kw electric melting pot has saved lead, provided accurate temperature control, and improved working conditions at the Seeyler Mfg Co, Etna, Pa., for the past four years.

Lead is kept precisely at desired 680 F for use in production of pole line hardware. Hot lead is poured into special molds and fused to the ends of galvanized steel "pins." The molds form threads in the lead where insulators are screwed on to pins.

This method is safer and more efficient than the fuel-heated pot formerly used and temperature of lead varied over a wide range which resulted in considerable loss of material and excessive heat and uncomfortable working conditions. Temperature of lead was maintained largely by guess work.

The electric melting pot has eliminated guess work and has made a substantial reduction in the loss of expensive and scarce lead. Working conditions have been improved greatly through the elimination of fumes and reduction in heat loss.



MELTING LEAD with a 3-kw electric melting pot keeps lead exactly at desired 680 F. Substantial saving in lead was effected by changing from fuel-heating to electric melting pot

CURBSIDE LOADING . . . All frequently used tools and materials are stored on the curb side—the safe side—of the truck.

IMPROVED ENGINEERING DESIGN . . . Derricks are carried at shoulder height. Hot sticks and ladders can be reached without climbing. Many other improvements.

FLUSH PANEL CONSTRUCTION . . . Pull type, *feather action* handles are flush with the side of the body. Two-stage lock strikers prevent doors from jarring open. Exclusive holder keeps doors open.

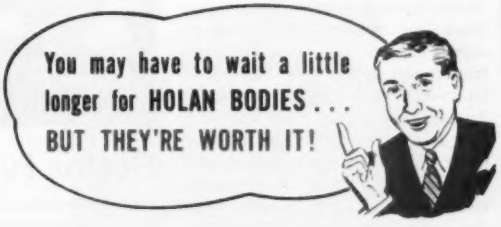
BETTER LOAD DISTRIBUTION . . . Holan bodies are engineered to place the weight more evenly on all four wheels, reducing strain on the chassis and reducing operating costs.

TWO PANEL DOOR CONSTRUCTION . . . Another first by Holan engineers! Reduces costs of maintenance, keeps the "new" look longer.

TO GET the real low-down on the quality and performance of Holan utility bodies, ask the men who use them.

In the past few years Holan engineers have introduced many new features in utility body design. These features, according to the men who have used Holan bodies, are responsible for many economies in their utility construction, maintenance and service work.

Don't take our word for Holan superiority. "*Ask the men who use Holan bodies.*"



The dependable name in utility bodies

J. H. HOLAN CORPORATION

BODIES AND ACCESSORIES FOR UTILITIES
4100 West 150th Street Cleveland 11, Ohio

DISTRICT SALES REPRESENTATIVES

2754 N. 92nd Street
Milwaukee 10, Wis.

New Orleans, Louisiana
863 Wilson Drive

6-03 161st Street
Beechhurst, Queens, N. Y.

DISTRIBUTORS

Baker Equipment Engineering Co.
Summit and Norfolk Sts., Richmond, Va.

Baker Equipment Engineering Co.
2401 Hutchinson Ave., Charlotte, N. C.

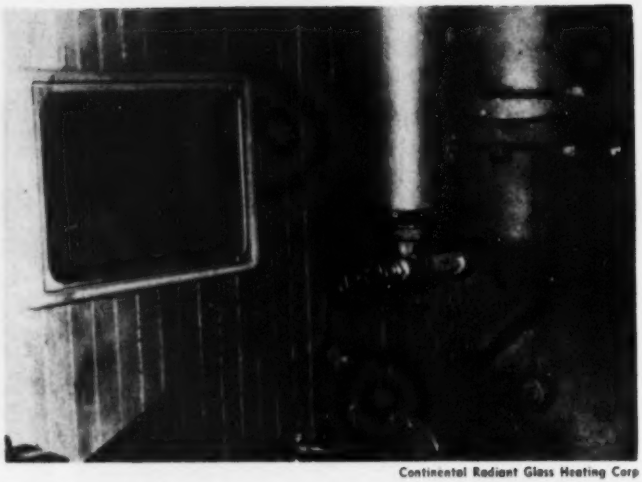
Schetky Equipment Corp.
810 S. E. 10th Ave., Portland 14, Ore.

INDUSTRIAL BRIEFS

Heating the hazardous acetylene gas generator room at the Pelton Steel Casting Co, Milwaukee, Wisconsin, with a hot water radiator heated by a 7500-w electric circulation heater has solved a difficult problem. Heating system is entirely satisfactory and meets all Underwriters and Industrial Commission requirements. Generator building is remote from other plant buildings. Heater was installed outside hazardous space and connected with piping and expansion tank to radiator within generator room. Switches and control equipment are also located outside room with only capillary bulb of thermostat in room. C. H. Swenson, Industrial Power Engineer, Wisconsin Electric Power Co.

Off-peak water heating with a 9-kw, 230-v, 3-phase electric circulation heater replaces gas and boosts employees' morale at Mac-It Parts, Inc, Lancaster, Pa. When customer's gas hot water heater failed, it was replaced by electric and now customer has three times as much hot water at a $100-per-year savings. Heater is attached directly to 150-gal storage tank, providing 100 gal of 160 F water. Previous installation produced only 30 gal of water. R. E. Smith, Industrial Rep, Pennsylvania Power & Light Co, Lancaster, Pa.

Drying glaze on ceramic tile with 36-kw infrared heat at Metropolitan Brick, Inc, Minerva, Ohio, has reduced ceramic tile handling losses from as high as 5% to less than ½%. Glaze is generally applied to the warm dry tiles as they emerge from the dryers. After passing through a spray booth where the glaze is applied, they are conveyed by belt to the continuous kiln cars. Handling of the tiles when they are being placed on the kiln cars causes high losses due to disturbing the moist glaze. With the infrared heat mounted above the conveyor belt between the spray booth and the kiln cars the glaze is dried sufficiently to reduce these handling losses to less than ½%. G. W. Craiglow, Industrial Power Engineer, Ohio Power Co, Canton, Ohio.



Continental Radiant Glass Heating Corp

Radiant Heating Reduces Fire Hazard

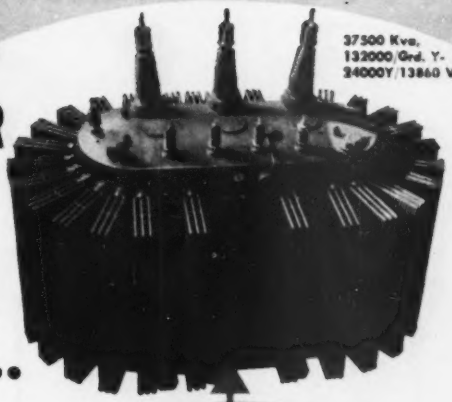
Radiant heating panel in control room of Pacific Oil Co's plant at Tiverton, R. I., reduces fire hazard and increases safety. Formerly-used fuel heating system caused several explosions resulting in fatal injury. There are three 1000-w, 230-v radiant heating units in the pump house and control room at the Tiverton plant and one 1000-w, 230-v unit in the sprinkler valve room of the company's plant at Fall River, Mass.

General Electric Co

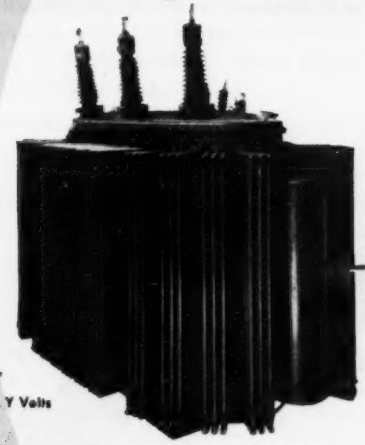
Electric Furnaces Make Better Tools

Use of two box-type furnaces at S. S. White Dental Mfg Co, Philadelphia resulted in faster production, fewer rejected pieces, and more uniform hardness of the tools, according to White Co engineers. "Electric heat," say the firm's engineers, "is more satisfactory than previous methods used in our processing because it is more constant and has less than 15% variation. Forgings are more uniform in hardness, facilitating machining and bending, and this results in fewer rejected pieces and faster production. The pieces average 85 to 90 Rockwell B, a high standard." Furnaces have rating of 1850 F and a capacity of 200 forgings a day of both carbon and stainless steel. The forgings are heated for 8 hr and then allowed to cool overnight before being removed. Load on furnaces is 29-kw and 19-kw respectively.

One of these large SELF-COOLED POWER TRANSFORMERS could have been ordered by YOU...



37500 Kva,
132000 Grd. Y-
34000Y/13860 Volts



20000 Kva,
110000Δ-
34500 Grd. Y Volts

INERT GAS PRESSURE

INERT GAS-OIL SEAL

Method of OIL PRESERVATION

OIL EXPANSION TANK

25000/31250 Kva,
72000Y-13800Δ Volts

If you are a user of transformers, you probably prefer a particular method of oil preservation for your transformers.

Here are three Power Transformers that were recently manufactured by Pennsylvania Transformer Company. Of special interest is the fact that each transformer is equipped with a different method of oil preservation.

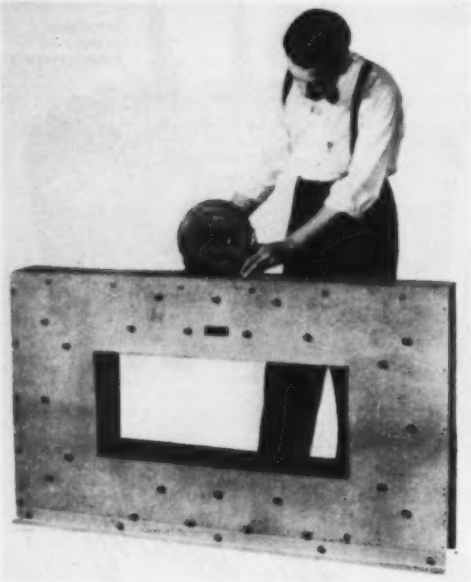
No doubt one of these methods, if not all of them, would meet with your requirements. But no matter what oil preservation method you specify, you can be certain that when it is incorporated into a Pennsylvania Transformer, it will function efficiently with the same amount of dependability as the rest of the transformer.

Pennsylvania TRANSFORMERS

Pennsylvania TRANSFORMER COMPANY

CANONSBURG, PA. • *Greater Pittsburgh District*

NEW EQUIPMENT



DC Current-Measuring Reactor

For measuring up to 120,000 amp, claimed normal accuracy ± ½ % available. Standard models of 1,000, 3,000, 5,000, 8,000, 10,000 amp, available higher ranges on special order.

Instrument leads are energized at low ac voltage, isolated from measured current. Leads are uncalibrated, length not critical. Instrument slips over bus, requires no bolt connection, uses small amount of ac power. The ac desaturates the core of a toroidal-wound coil on each half cycle. Valve of ac depends on amount of desaturation, is proportioned to dc saturation current.

General Electric Co, Schenectady, N. Y.

Raintight Switch

Front operated Type A said to permit close ganging. Cover when raised remains horizontal to free inspector's hands. Available in 30, 60, 100, 200-amp ratings.

Federal Electric Products Co, Newark 5, N. J.

Electric Welder

Operates from 110 or 220 power lines, handles electrodes from ⅛ to ⅜ in. Movable primary coils permit infinite current adjustment through low and high welding ranges. Weighs 156 lb, mounted on two 5-in rubber wheels in heavy steel case. Detachable welding cables with jack plugs.

Miller Electric Mfg Co, Appleton, Wis.

Hot Line Clamps

Aluminum body tap clamp for aluminum to copper, aluminum to aluminum, copper to copper connections. Clamp is plated to specified thickness with fortified cadmium. One type clamp for all connections reduces error and inventory problems. Furnished in two body styles, range of sizes.

A. B. Chance Co, Centralia, Mo.

Mica Undercutter

The Model H Mica-Miller is portable, ac or dc operating, weighs 7¼ lb. Driven by 1/5 hp Universal motor at 2,800 rpm full spindle speed, the three interchangeable heads cut U or V slats. Heads are equipped with depth gauges, can be used with saws or V-cutters 23/32 to 1¼-in dia on variety of commutator sizes. The two smaller heads have slot guides, the largest head has roller supports.

Martindale Electric Co, Cleveland 7, Ohio

(*Continued on page* 154)

LET'S TALK WIREHOLDERS . . .

HUBBARD 4-11-44 *has what it takes*

No other wireholder combines so many desirable features as the famous HUBBARD 4-11-44 . . . advantages which have been proven in millions of installations.

HERE'S THE LIST....

1. Designed so that the heavy Copperweld bail takes all the tension . . . the porcelain is subjected to compression only.
2. The smoothly rounded surfaces avoid damage to insulation.
3. The special wood screw is sharp-pointed, easy to start by hand; the threads are sharp, deep, clean-cut, for fast insertion. No other wireholder screw on the market can match the Hubbard design for ease of installation or holding power.
4. The thread is cut clear to the base, and gives a strong grip, even in material considerably thinner than the length of the screw.
5. The heavy steel base is Hubbard double-dip hot galvanized, to effectively prevent corrosion or rust streaks; the 4-11-44 is built to resist the elements through the years. There are no closed pockets to retain moisture and dirt that cause unsightly streaks.

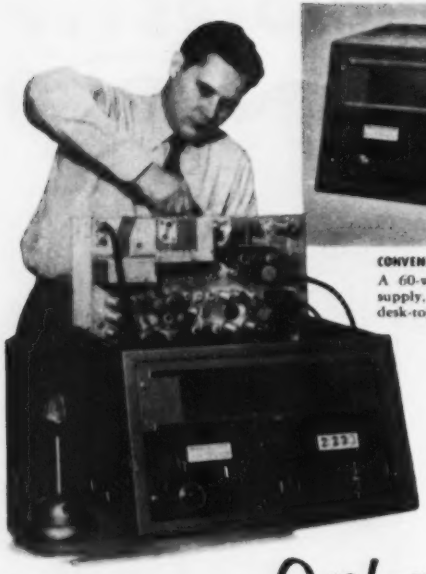
Exhaustive tests have proved that the Hubbard 4-11-44 has the greatest dead-end strength of any wireholder manufactured, plus sufficient strength on angular attachments to provide proper margins of safety over any load which would be encountered consistent with approved engineering practice.

HUBBARD AND COMPANY

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"



CONVENIENCE IN OPERATION—
A 60-watt transmitter, receiver, power supply, and controls—in a single unit for desk-top operation. Available in 30-50 mc range, 152-174 mc range.

CONVENIENCE IN MAINTENANCE—
Chassis slides up for complete accessibility. Cabinet acts as handy, solid servicing rack. No need to remove chassis from cabinet.

NOW see what CONVENIENCE means with RCA's new 2-way radio station

CONVENIENT!
Compact, space-saving design
Complete base station in a single desk-top unit using less than 3½ square feet of desk space—saves valuable floor space.

CONVENIENT!
Up to 3 transmitter channels, 2 receiver channels
Designed for up to 3-channel transmission and 2-channel reception where required. Lights on front panel indicate frequency in use.

CONVENIENT!
Easy to install and service
Just plug in transmission line and AC power and you are ready to operate. Lift-out chassis for servicing in cabinet. Metering plugs for easy checking.

CONVENIENT!
Local or remote operation
Choice of local or remote control base station in single, compact cabinet. Chassis also available in standard cabinet rack or weatherproof, pole-mounting box.

For further details on the new RCA 60-watt desk station, MAIL COUPON NOW

Dept. 65-JD, RCA Engineering Products,
Camden, New Jersey

( ) Please send me information on new Carfone desk station.

Also send me information on 2-Way Radio for:
( ) General Industry (Utilities, Construction, Petroleum, Lumber, Mining, etc.)
( ) Transportation (Trucks, Buses, Taxis) ( ) Public Safety (Police, Fire, Ranger)

Name_____

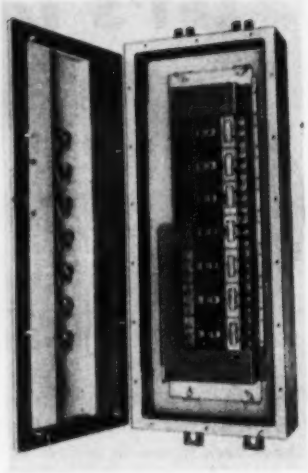
Title_____

Organization_____

Address_____

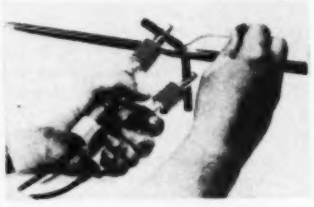
City_____ Zone_____ State_____

RCA **RADIO CORPORATION of AMERICA**
MOBILE COMMUNICATIONS CAMDEN, N. J.



Dust-Tight Breaker Panel

Weather-resistant cast aluminum panelboard will accommodate up to eight 3-pole 100-amp 600-v circuit breakers in Class II hazardous (dusty) locations. Circuit breakers are factory wired to main busses, panelboard can be top or bottom fed. Type DTP.
Crouse-Hinds Co, Syracuse, N. Y.

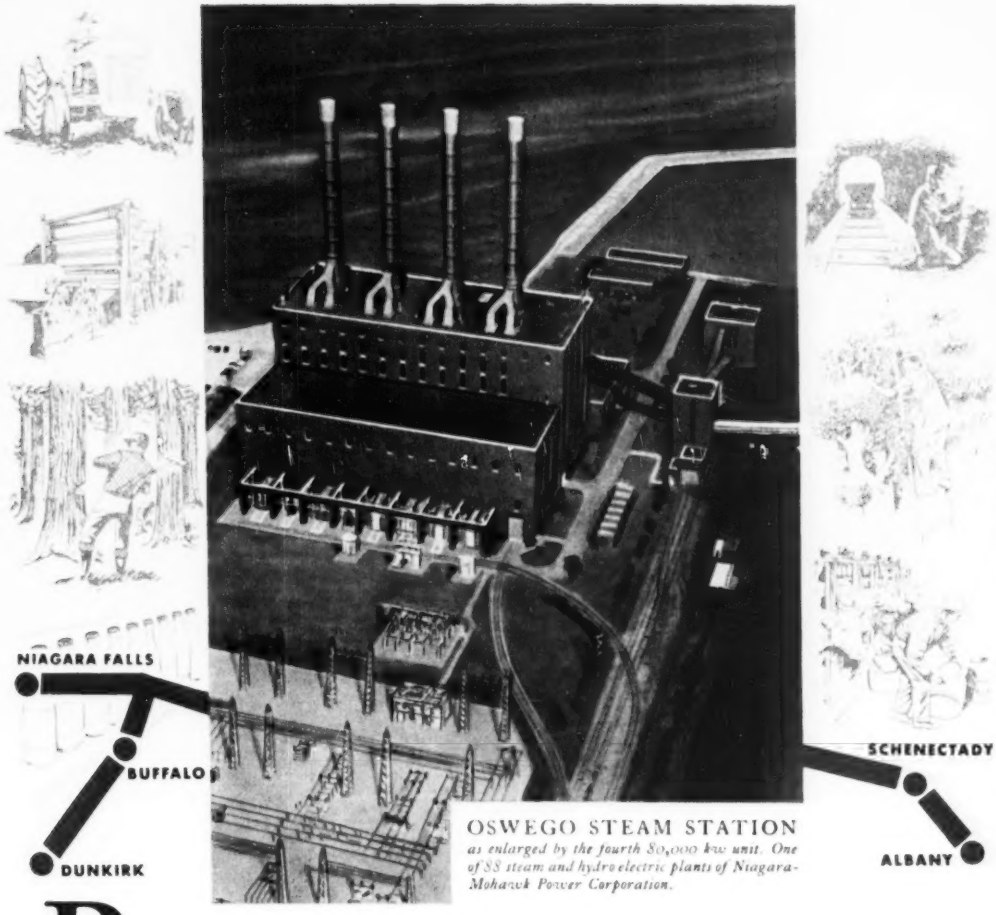


Resistance Solderer

Needs no ground for soft soldering. Called Pliers Handpiece, device holds two carbon tips to both sides of tubular joint, up to 5/8-in dia. Made of aluminum and hard fiber, device holds tips in contact with work by spring tension.
Wasserlein Mfg Co Inc, Joliet, Ill.

Volt-Ammeter

Pocket-sized, with nine ranges to 300 amp and 600 v. Snap-around type Amprobe 300 measures current without line interruption or ammeter con-



OSWEGO STEAM STATION
as enlarged by the fourth 80,000 kw unit. One of 88 steam and hydro electric plants of Niagara-Mohawk Power Corporation.

PRIVATE ENTERPRISE *In Action*...

The Niagara-Mohawk Power Corporation has 7000 circuit-miles of transmission lines and 85,000 conductor-miles of distribution lines in upper New York state. Its entire system has a rated capacity of 2,186,451 kw with 600,000 kw now under construction.

A current example of their enterprise is the Oswego Steam station, designed by their engineering department with construction supervision by Stone & Webster Engineering Corporation.

The benefits of competent business management of a privately-owned utility are again demonstrated by the Niagara-Mohawk system.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY *of* STONE & WEBSTER, INC.

Today's modern Wood Preserving Plants know how to protect poles with creosote and leave them dry and "clean." Specifications for clean treatment, when combined with proper specifications for the creosote used, provide "complaint-free" poles.

One of the largest producers of pressure-creosoted poles reported to us: "We haven't had a single complaint about the cleanliness of the last million yellow pine poles treated with creosote."

For poles that are *clean*—for poles that *will last*—specify "dry pressure-creosoted poles."

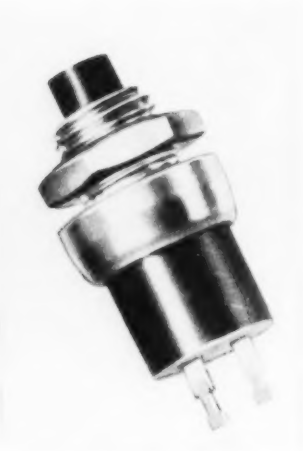
KOPPERS COMPANY, INC., PITTSBURGH 19, PA.
Tar Products Division

You can count on Koppers for Creosote!

KOPPERS
All Standard Specifications
Creosote
The Performance-Proved Wood Preservative

nections. Ranges 0-6/15/30/60/150/300 amp ac, 0-150/300/600 v ac. Jaws are completely insulated, test leads have retractible plug which insulates itself when removed from meter.

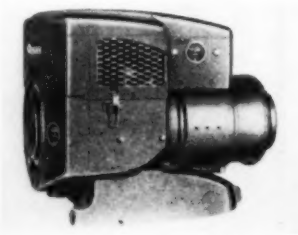
Pyramid Instrument Corp, Lynbrook, N. Y.



Push-Button Switch

1.047 in long, ½ in maximum width. Contact resistance reported 0.007 ohm max before use, 0.015 ohms max after 200,000 operations. No. 23-1 is normally open, SPST, momentary contact, rated ¼ amp 115 v, AG, non-conductive. Single hole mounting bushing is ☆-32 thread.

Grayhill, 4524 W. Madison St, Chicago 24, Ill.



Generating Plant

Rated 3,500 w ac, with 4,000-w peak overload capacity for up to 2 hr. Output 115 v 60 cps, powered by 2-cylinder 4-cycle air-cooled gasoline

To master high temperatures and pressures these leading companies use

M. W. KELLOGG

power piping!

American Gas & Electric Service Corp.
Boston Edison Co.
Central Hudson Gas & Electric Co.
Chaudronneries A. F. Smulders (Belgium)
Compania Argentina De Electricidad (Argentina)
Compania De Fuerza Del Sureste De Mexico S.A. (Mexico)
Consolidated Edison Co. of N. Y.
Detroit Edison Co.
Dow Chemical Co.
Elektricitetsselskabet Isefjordsvaerket (Denmark)
Ford Motor Co. of Canada Ltd. (Canada)
General Electric Co.
Hartford Electric Light Co.
Houillieres Du Bassin De Lorraine (France)
Houillieres Du Bassin Du Nord Et Du Pas-De-Calais (France)
Hydro-Electric Power Commission of Ontario (Canada)
Indiana & Michigan Electric Co.
Interbrabant (Belgium)
Long Island Lighting Co.
Metropolitan Edison Co.
Monterrey Light & Power Co. (Mexico)
Monongahela Power Co.
New York State Electric & Gas Corp.
Niagara Mohawk Power Corp.
Palestine Electric Corp., Ltd. (Israel)
Philadelphia Electric Co.
Public Service Co. of Northern Illinois
Public Service Electric & Gas Co. of N. J.
Societe Anonyme John Cockerill (Belgium)
Societa Edison (Italy)
Societe Financiere De Transports Et D'Entreprises Industrielles (Sofina) (Belgium)
Societa Meridionale Di Elettricita (Italy)
Sociedad De Electricidad De Rosario (Argentina)
Union D'Electricite (France)
United Illuminating Co.
Westinghouse Electric Corp.
West Penn Power Co.
Wisconsin Public Service Corp.

M KELLOGG W

6000 Pictures Looking for "Eyebrows" in critical power piping . . . *because*—

Through the photomicroscope, metallurgists carry on a never-ending search for evidence of graphitization, the phenomenon which prior to 1943 was considered of only academic interest.

They are hunting particularly for what they call the "eyebrow" or chain type of graphite. It is these malformations that cause planes of weakness in carbon steel and carbon moly hi-temp-hi-pressure power piping . . . weaknesses that can result in serious failures.

Since graphitization occurs only after piping has been in high temperature service for sometime, means of precluding its formation can usually be determined only from studies of specimens in which the phenomenon has occurred.

Although the "whys" are unknown, metallurgists have already come up with methods of inhibiting the formation of graphite in carbon steel or carbon moly piping. Annealing welds at about 1300 F appears to help. Addition of chromium to carbon moly analysis piping seems to preclude graphite formation entirely; at least no graphitization has yet been detected in this type of piping which Kellogg recommended for such severe service nearly a decade ago.

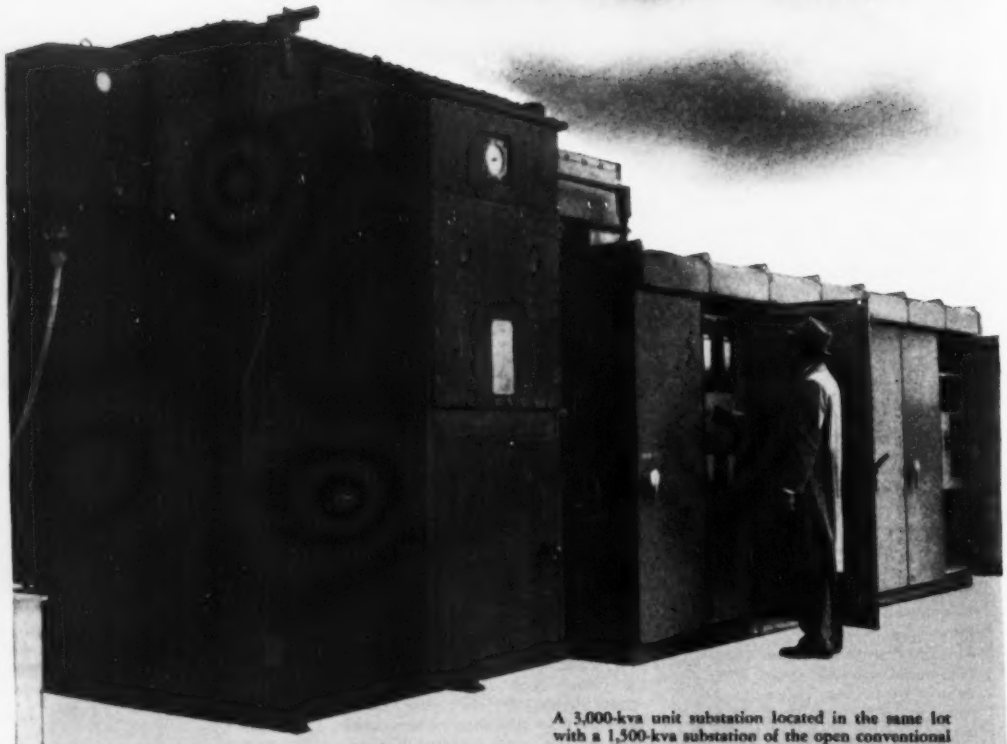
Still Kellogg metallurgists continue to research the problem, endeavoring to pinpoint the causes of graphitization and to improve fabricating techniques and materials. More than 6,000 test pieces —cut out of actual service piping —have been polished, etched, photographed and evaluated in the last nine years. Such fundamental knowledge is a valuable *plus* obtained by any utility company when it specifies "Main steam and reheat piping by Kellogg".

OTHER FABRICATED PRODUCTS including:

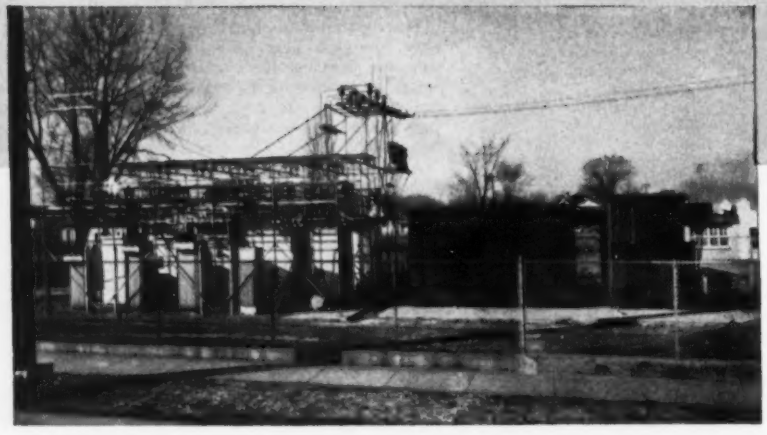
Pressure Vessels . . . Vacuum Vessels . . . Fractionating Columns . . . Drums and Shells . . . Heat Exchangers . . . Process Piping . . . Bends and Headers . . . Forged and Welded Fittings . . . Radial Brick Chimneys

for 51 years an integral part of industrial progress!

The M. W. Kellogg Company (A Subsidiary of Pullman Incorporated)
New York, Jersey City, Buffalo, Los Angeles, Tulsa, Houston, Toronto, London and Paris.



A 3,000-kva unit substation located in the same lot with a 1,500-kva substation of the open conventional design. The open-type equipment was later removed.



Midwest utility modernizes system, solves load problem

WITH WESTINGHOUSE UNIT SUBSTATIONS

The experience of Iowa-Illinois Gas & Electric Company with unit-type substations will interest progressive system planners. It suggests a way to attain this important objective: *a simplified flexible system providing long-range operating economies.*

"Load growth in our area made it imperative for us to modernize our distribution system. After considerable study it was decided to use factory-built, unit-type substations.

"Westinghouse Unit Substations of co-ordinated unit design met our requirements . . . maintenance has been very slight . . . location of the substations close to the load center keeps losses to a low value and provides for better regulation. Future expansion is simply and economically handled by adding unit substations in areas of maximum load growth —or by moving a substation in its entirety, if load shifts, thereby salvaging the bulk of the investment."

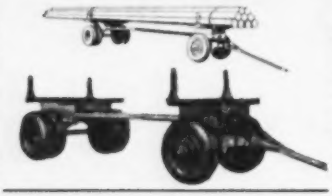
Iowa-Illinois Gas & Electric enjoys these benefits because Westinghouse Unit Substations are specifically designed to meet today's power distribution problems. Unitized construction simplifies expansion to accommodate increased load requirements. Individual feeder regulation can often be eliminated and Westinghouse Unit Substations offer these same advantages to you.

For complete information, get your copy of Booklet B-4061. Ask your Westinghouse Representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60779

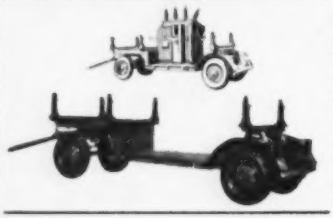
Notes on Eagle Equipment —
Designed to save man-hours and money

TRAILERS

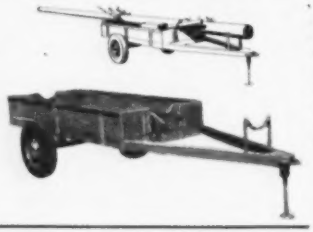
...IN A WIDE RANGE OF SIZES AND TYPES



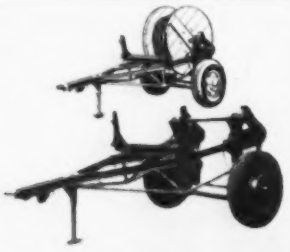
ADJUSTABLE LENGTH POLE TRAILER: easily adjusts to accommodate poles up to 90 ft. long — a big trailer that does a big job. Center pole telescopes. Trails smoothly. Equipped with electric brakes on rear wheels. Get complete information on Eagle Trailer Model 6450.



FOUR-WHEEL LO-BED TRAILER: for easy loading and hauling of heavy bulky units, also suited to pole and general purpose hauling. Five ton capacity, overall length 25 ft. 8 inches. Distance ground to low platform only 25½ inches. Equipped with electric brakes on rear wheels. Get complete information on Eagle Trailer Model 6441.



LIGHT-DUTY CARGO AND GENERAL PURPOSE TRAILER: light-duty, 1-ton capacity trailer for hauling one or two poles, cross-arms, pole hardware, etc. Has pole saddles front and rear and removable end boards. Get complete information on Eagle Trailer Model 7163.



COMBINATION CABLE REEL AND POLE TRAILER: complete with bolsters, stanchions, cable reel saddles. Quickly converted into a pole trailer by removing cable reel saddles and installing bolsters. A practical dual purpose unit, requiring only one trailer license. Get complete information on Eagle Trailer PCP — W-PCP series.

Send today for the complete catalog of Eagle Line Construction and Maintenance Equipment — a useful reference book.

EAGLE

BODIES • TRAILERS
DERRICKS • TOOLS
ACCESSORIES

Designed by Grayson

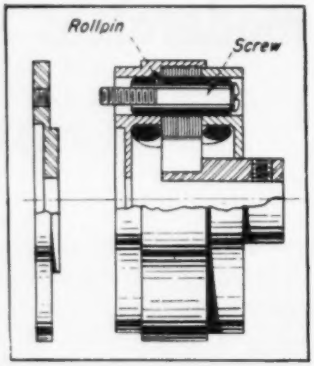
EQUIPMENT ENGINEERED BY AND FOR UTILITY MEN EXPRESSLY FOR THEIR NEEDS

EAGLE MANUFACTURING CO., Appleton, Wis.

Division of The Four Wheel Drive Auto Co.

engine. Voltage regulation is plus or minus 3%. Fuel consumption at rated load is 0.68 gallons per hr. Manual or remote starting, with fully automatic and line transfer controls available.

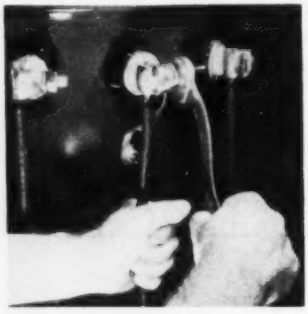
D. W. Onan & Sons Inc, Minneapolis 14, Minn.



Synchronous Brake

For precision dc or induction motors. Brake stator is made of silicon steel laminations between aluminum cover plates held together by special pins. Long screws through the hollow pins fasten the stator to motor housing.

Allard Instrument Corp, New York, N. Y.

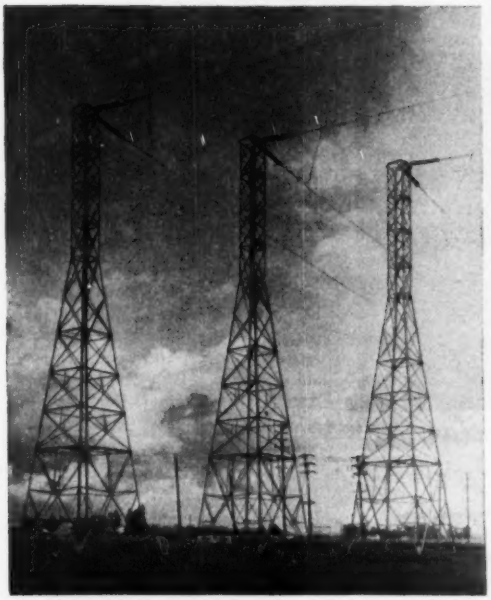


High-Strength Alloy

Transformer eyebolt is made of non-corrosive alloy of copper, nickel, silicon and iron. Called Sternicor, it is said to be of high strength and not susceptible to stress corrosion or season cracking when clamped to any

Demand PROOF OF PERFORMANCE

for Superior Insulator Quality

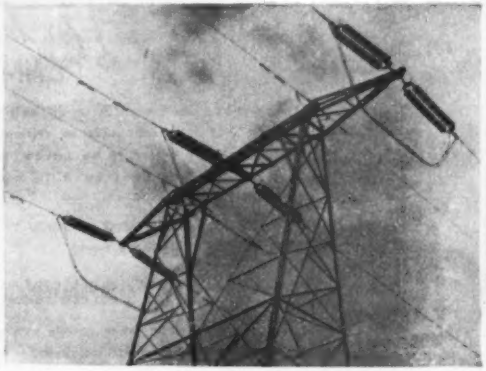


On right-angle towers, Thomas Insulators have the stamina that assures long life and trouble-free performance.

"Repeat Orders" are the best proof of insulator quality . . . and are the best evidence that all insulators are not alike.

Shown on this page are just two of the many Thomas insulator installations on the lines of one of the largest Western Utilities. For many years, this Customer has given us order after order. Such *repeat orders* from this and other companies are the best testimonials to the long life and outstanding performance of Thomas Insulators.

After all is said . . . it's still quality that counts plus proper designing, precision manufacturing . . . and PROOF OF PERFORMANCE. Throughout the world, Thomas Insulators have been establishing service records since the advent of the Electrical Industry. Why gamble?



Thousands of Thomas Insulators make certain that this 220-kv line will give satisfactory service for decades to come.

The R. Thomas and Sons Company is a manufacturer and designer of all types of porcelain insulators . . . pin-type, switch, suspension, spools, guy-strain, bushings and special high-voltage porcelain. In addition, Thomas supplies associated line hardware, clamps, fittings, preformed armor rods, and so on.

SPECIFY THOMAS INSULATORS—THE BEST BY LINE TEST

— Since 1873 —

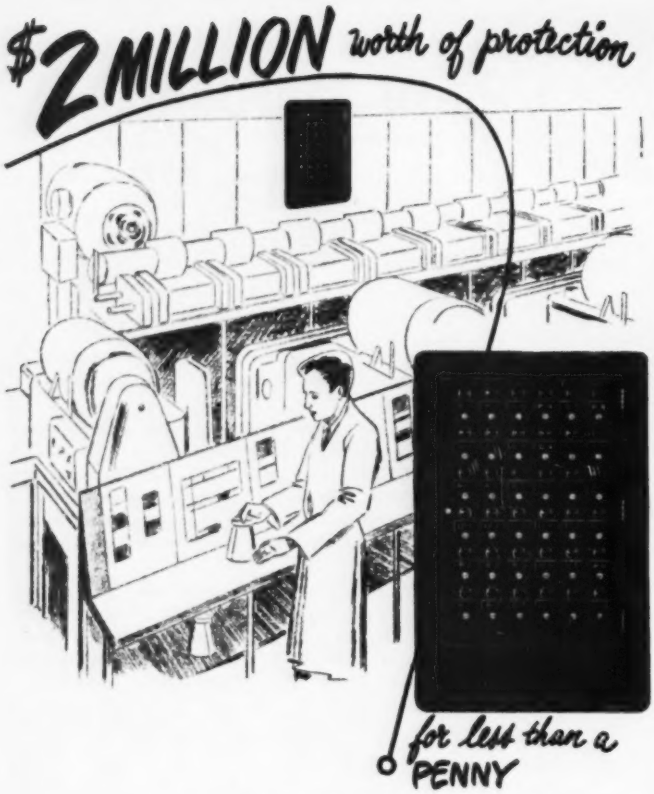
The R. Thomas and Sons Co.

1873 THOMAS INSULATORS our 79th year RELIABILITY 1952

LISBON, OHIO

NEW YORK CHICAGO

Sales Representatives: C. G. Anderson, *Chicago* • E. B. Anderson Co., *Detroit* • Ken H. Best, *Seattle* • R. E. Cunningham & Son, *Los Angeles* W. H. Eddy Products Co., *Phoenix, Ariz.* • Engineer Sales Corp., *St. Petersburg* • Hamilton Associates, *Denver* • Geo. E. Honn Company, *San Francisco* • W. J. Hugo, *Minneapolis* • Leiser & Company, *Philadelphia* • John G. Pettijohn Company, *Knoxville* • H. E. Ransford Co., *Pittsburgh* • J. F. Schaefer & Co., *Kansas City* • R. J. Sullivan & Company, *Boston* • Tafel Electric & Supply Co., *Louisville* • Walter E. Thompson, *Birmingham* • Triangle Electric Supply Company, *El Paso* • United Electric Supply Co., *Salt Lake City* • Williamson Sales Co., *Shreveport, Amarillo, Dallas, Houston, New Orleans, Pine Bluff* • *Representatives in other principal cities*



Today, when equipment is so difficult to replace, production and time schedules so critical, manpower so scarce, can you afford to be without the positive help and protection afforded by *AUTH* automatic *audible* and *Visible Signals*?

PROTECT YOUR EQUIPMENT - - SPEED YOUR PROCESS - - SAVE YOUR PRODUCT by using

AUTH SUPERVISORY ANNUNCIATORS

Here's how they work: when trouble occurs, a supervisory annunciator receives an electrical impulse from a normally open or normally closed, momentary or maintaining contactor, such as a thermostat, pressure or float switch. This impulse is converted in the annunciator circuit to a maintaining circuit that operates a visible signal indicating the source of trouble, and simultaneously sounds an audible alarm. Various operations sequences are available.

Write today for complete descriptive literature, without obligation!

SINCE 1892 AUTH

COMPLETE SYSTEMS ● ONE RESPONSIBILITY

AUTH ELECTRIC COMPANY, INC.

34-20 45th St., Long Island City 1, N.Y.

MANUFACTURERS OF: Electrical Signaling, Communication and Protective Equipment for Housing, Hospitals, Schools, Offices, Ships, and Industry.

tension within its ultimate strength. Sand casting the alloy gives 90,000 psi tensile, 70,000 lb yield strength. Hot forging gives 107,000 psi tensile, 83,000 lb yield strength.

Developed in cooperation with Revere Copper and Brass Inc. by **General Electric Co, Schenectady, N. Y.**

Throwing Weight

For handline work, consists of lead core in sponge rubber shell and rubber outer lining, 4½-in long, 3-in dia, weight 13½ oz. Claimed to be unaffected by water, corrosives, temperature.

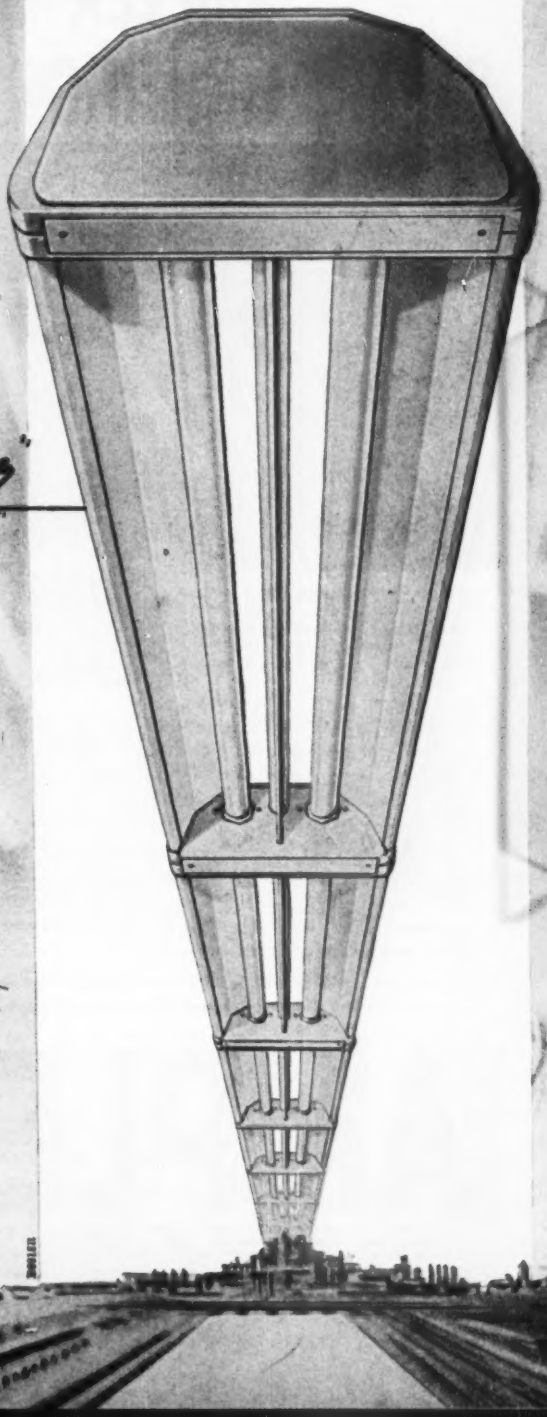
Automotive Rubber Co, Detroit, Mich.

Insulation Tester

Model P-1 plug-in direct-reading megohmmeter for portable or bench operation. Hardwood case, removable cover, operates on 115 v 60 cps.

now, a new high in seeing comfort

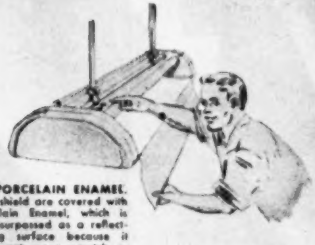
through sensationally-increased UPWARD LIGHT...



Now, approximately ¾ of light is directed UPWARD through a completely new, precedent-shattering concept of lighting unit design! The new Benjamin "Task-Master" is the modern solution to the brightness ratio problem. By combining greater upward flow of light with a new high of 35° in lamp shielding, "Task-Master" doubles, even triples, present standards for industrial seeing comfort. In addition to sensationally-increased UPWARD light and lamp shielding, "Task-Master" features revolutionary new, easier methods of installation and maintenance, such as those illustrated below. Send for FREE "Task-Master" Bulletin, giving further details. Write for Bulletin AD 5906. Benjamin Electric Mfg. Co., Dept. K, Des Plaines, Illinois.

BENJAMIN "Task Master"

Sold Exclusively through Electrical Distributors

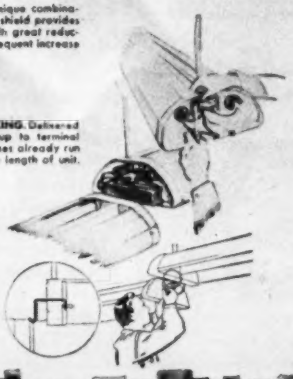


DETACHABLE REFLECTORS are hinged to make possible easier, more thorough cleaning right on the fixture. They may also be detached and cleaned away from the unit. Available with sliding hangers, as shown.

"LIFE-TIME" PORCELAIN ENAMEL. Reflectors and shield are covered with genuine Porcelain Enamel, which is unsurpassed as a reflecting surface because it cannot wear, scratch or become dull.

"SPRINGLOX" LAMPHOLDERS are standard equipment. These rugged, all-metal, lifetime lampholders facilitate lamping and relamping through patented spring design.

LONGITUDINAL SHIELD. Unique combination spine-support and lamp shield provides shielding angle of 35°. Result: great reduction of direct glare with consequent increase in seeing comfort.



PRE-WIRED—NO WIRE SPLICING. Delivered with all connections made up to terminal block. Branch-circuit wire comes already run through spine support, entire length of unit.

SPECIAL "HOOK-UP" DESIGN makes it possible for the installer to temporarily hang one unit on another while connecting the jumper wires to opposite terminal blocks.

Better light in the nation's capital!

AMPLEX STREET LIGHTING LAMPS

Amplex Street Lighting Lamps bring improved lighting on Constitution Ave. (above) and on approach to So. Capital St. Bridge (right). Installation made by Potomac Electric Power Company.

FROM ONE COAST TO THE OTHER, Amplex Street Lighting Lamps are the fastest-growing choice of cities and utilities. Experience shows that these lamps give outstandingly superior service . . . and so they should! They're designed and premium-built to withstand the vibration and jolts of fast-moving traffic . . . to burn longer and to maintain their high light output.

In the Amplex line there's a street lighting lamp of the right type and wattage for every purpose. And for truly maximum life and dependability there's nothing equal to Amplex *Weatherproof Bulbs*. They're made of moisture-resistant "hard glass" that survives the severest climatic conditions and cuts service costs to new lows.

It will pay you to get all the facts about Amplex Street Lighting Lamps. Just write **Amplex Corporation, Dept. J-10 111 Water St., Brooklyn 1, N. Y.**

AMPLEX

Sealed-Beam Reflector Lamps, Colorbeam Lamps, Spotlites and Floodlites, Industrial Infra-Red Heat Lamps, Vibration and Rough Service Lamps, Street Lighting Lamps, Traffic Signal Lamps, Incandescent Lamps, Fluorescent Tubes, Display Accessories.

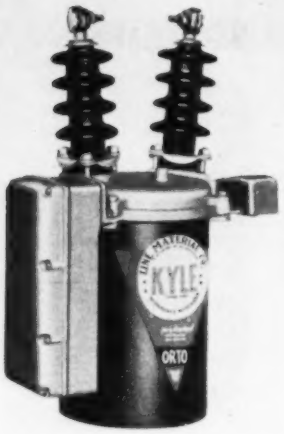
5-in mirror scale is individually calibrated. Ohmmeter movement is said to be independent of voltage variations and requires no adjustment during normal operation. Self-contained power supply puts out 500 and 1,000 v d c. Single or double range models have ranges of 100, 1,000 or 2,000 megohms.

Herman H. Sticht Co, 27 Park Place, New York, N. Y.

Differential Thermostat

Controls inside surface temperatures to fixed amount above outside temperature, to prevent condensation inside outdoor enclosures such as switchgear cubicles, control houses, storage buildings, etc.

Syntral Designs, Box 105, Marcellus, Mich.



Remote Control Oil Switch

Motor operated, rated 14.4 kv, 200 amp nominal load and 9,000 amp RMS asymmetrical momentary current. Designed for low cost switching of capacitors to 3,500 kvar, street and flood lighting, sectionalizing, load-break and remote control switching.

Contact structure is such that heavy currents increase contact pressure for high momentary and short time current ratings. Bushings are oil-filled for low radio noise level, terminals take aluminum or copper conductor, No. 8 to 2/0. Tank holds 1½ gal

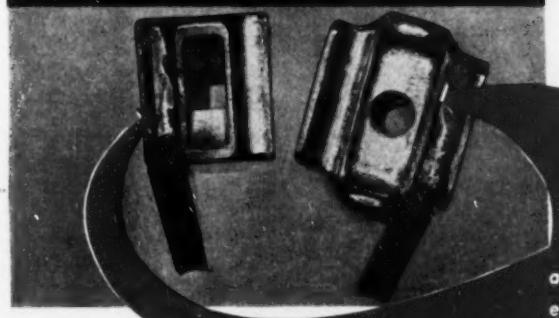
(*Continued on page* 168)

THERE IS **NO SUBSTITUTE FOR . . .**
MORE THAN *25 Years Experience*

When Making Copper to Aluminum Connections Use

Cast Aluminum Connectors with Copper Liners

CAST ALUMINUM CONNECTOR OF OTHER MANUFACTURE



FOR CONTINUITY OF SERVICE *Be Sure* BY TEST COPPER LINERS ARE PROPERLY BONDED TO ALUMINUM CLAMPING MEMBERS.

Examination Discloses:

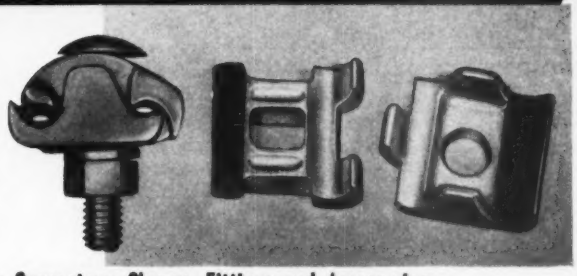
Poor Bond with voids allowing moisture and atmospheric contamination to enter between aluminum clamping member and copper liner causing electrolytic action and connector failure.

TEST:

COPPER LINERS EASILY PEELED LOOSE FROM ALUMINUM CLAMPING MEMBERS

CAST ALUMINUM CONNECTOR

COPPER LINERS SECURELY BONDED TO ALUMINUM CLAMPING MEMBERS BY AN EXCLUSIVE PROCESS WHICH PREVENTS VOIDS IN BOND. YEARS OF SATISFACTORY CONNECTIONS CERTIFY THE USE OF THESE CONNECTORS.



Be Sure **Buy Aluminum Connectors, Clamps, Fittings and Accessories backed** with more than *25 Years* of Electrical, Mechanical and Metallurgical Knowledge and Manufacturing Experience **gained in Meeting and Maintaining the most Exacting Standards of the Electrical Industry.**

OUR PRODUCTS ARE QUALITY CONTROLLED FROM INGOT TO FINISHED PRODUCT

CONSULT ONE OF OUR NEAREST EIGHTEEN REPRESENTATIVES OR CONTACT OUR MAIN OFFICE

ANDERSON BRASS WORKS, Inc.

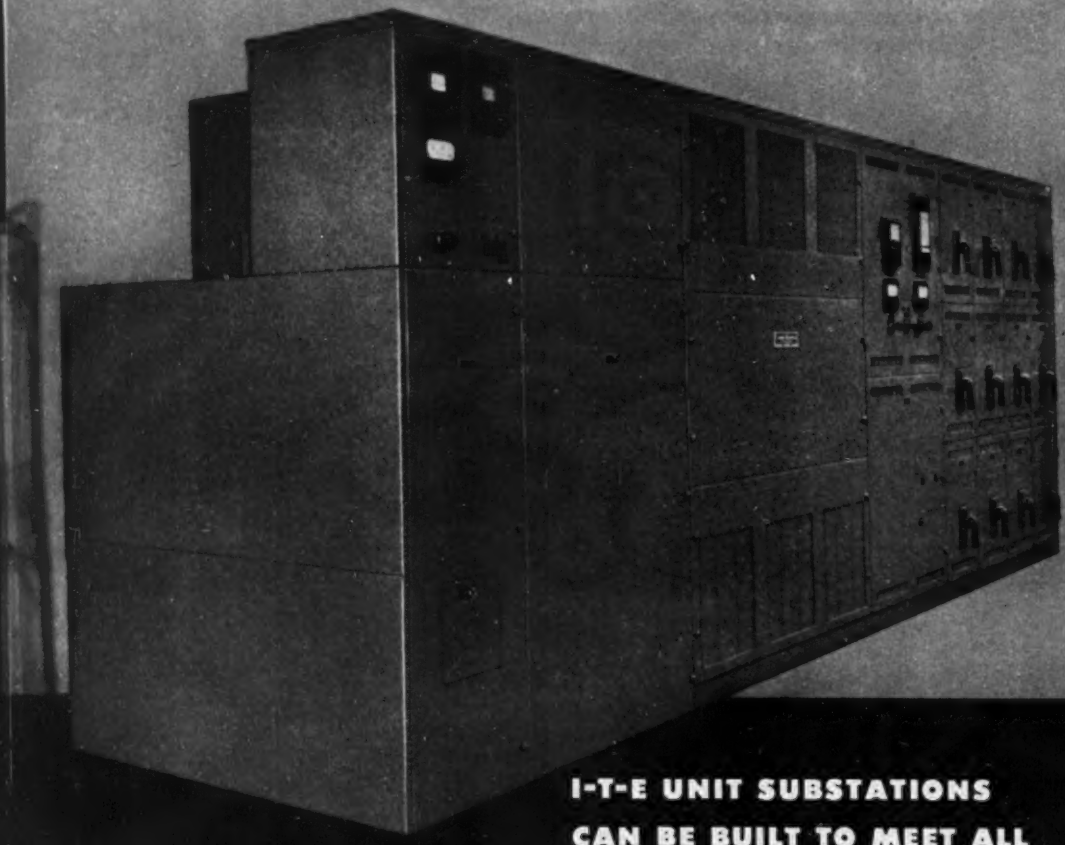
Aluminum *Bronze*

POST OFFICE DRAWER 2151

BIRMINGHAM, 1, ALABAMA

SUBSTATION — TRANSMISSION — DISTRIBUTION

HOW MUCH WOULD A POWER



I-T-E UNIT SUBSTATIONS CAN BE BUILT TO MEET ALL NEMA "USUAL and UNUSUAL" SERVICE CONDITIONS

Indoor and outdoor – in any required ratings

TRANSFORMER TYPES INCLUDE:

OISC
Non-inflammable liquid-filled
Class B air-cooled (illustrated above)
Class H air-cooled
Class H, nitrogen-filled, sealed tank

YOU SAVE THROUGH –

1. Better voltage at point of use.
2. Lower conductor cost—shorter runs of LV cable.
3. Shorter installation time—Substations shipped as complete packages.
4. Use of lower interrupting capacity breakers.

GET THE FULL STORY –

See your local I-T-E representative for details—or write for Catalog Section 9000 today.

FAILURE COST YOUR PLANT?

Suppose a prolonged power interruption suddenly hit your plant! How much would it cost you in lost production, down-time—perhaps ruined product, equipment damaged beyond repair?

To all plants, *service continuity* means profits. In some, service continuity is the most important single consideration in planning the vital electrical distribution system.

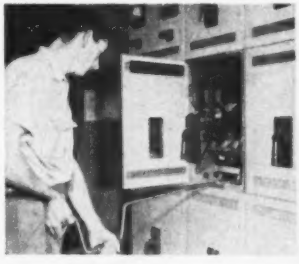
Assure service continuity—Install modern I-T-E Unit Substations

No matter what your service continuity requirements may be, I-T-E can offer you the benefits of long experience—supply the equipment to meet them all. You get:

FLEXIBLE SYSTEM PLANNING. *Sectionalization* (I-T-E Unit Substations strategically spotted throughout the plant) *limits* the area affected by power interruption. You can plan your system to provide immediate restoration of service—or actual *elimination* of interruption on unaffected circuits.

SELECTIVE TRIPPING. Sectionalization can be carried right down to the *individual* I-T-E circuit breaker—the individual machine or feeder. The versatile I-T-E Direct-Acting Selective Overcurrent Trip Device helps *isolate* faults. If there's a sustained overcurrent or short circuit in any branch of the system, only the breaker closest to the fault will open.

MODERN DRAWOUT CONSTRUCTION. Even maintenance requires little or no down-time. With modern I-T-E drawout construction, total outage time during maintenance is only a few minutes. Circuit breakers of like characteristics are interchangeable. One spare breaker—for quick replacement—provides economical insurance for a number of feeder circuits.



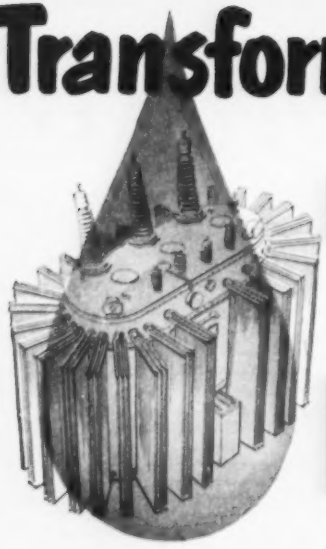
I-T-E

UNIT SUBSTATIONS

I-T-E CIRCUIT BREAKER CO. • 19TH & HAMILTON STS. • PHILA. 30, PA.

CANADIAN MFG. & SALES: EASTERN POWER DEVICES, LTD., TORONTO • EXPORT SALES: PHILIPS EXPORT CORP., N. Y. 17, N. Y.

Transformer Oils last longer with DBPC



WHEN Di-tert-butyl-para-cresol (DBPC) is added in liquid form to transformer insulating oils, their resistance to oxidation is increased and their useful life is greatly extended.

The value of Koppers DBPC as an inhibitor for new or reclaimed oil has been proved. Actual use has confirmed the accelerated oxidation tests shown below. Further, many manufacturers of transformers now endorse the use of DBPC, and most major suppliers of transformer oil will, on request, furnish new oil that has been inhibited.

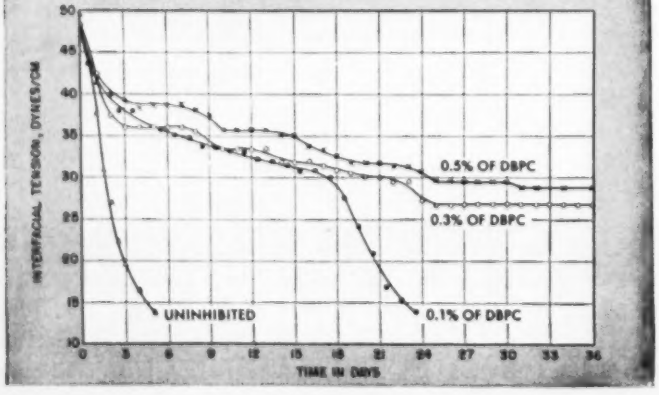
When ordering new or make-up transformer oil, make certain it is inhibited. And use DBPC to prolong the life of your reclaimed oil. The savings you'll get will be worth your while.

If desired, we can furnish a compounded oil solution of DBPC called Impruvol 20. Impruvol 20 can be used with simple equipment. Its application presents no more problem than the application of insulating oils themselves. Order Koppers DBPC or Koppers Impruvol 20; the choice is yours.

KOPPERS

KOPPERS COMPANY, INC.
Chemical Division Pittsburgh 19, Pa.
Dept. EW-10-20

Interfacial Tension values under 95°C Oxidation Tests show DBPC inhibited oil impressively delayed in oxidation and at no stage as rapid as uninhibited oil.



oil, is provided with dip stick. Actuated by 117 v 60 cps single-phase motor, requiring 100 v minimum. L-M Kyle Type NR.
Line Material Co, Milwaukee 1, Wis.

MORE NEW PRODUCTS
about which you should know

Westinghouse Elec Corp, Pittsburgh 30, Pa now has a variable frequency **audio amplifier** capable of either 5 or 10 kw output. The amplifier will take a signal of about 10 mw from any 30 to 10,000 cps source and amplify it to 5 or 10 kw with uniform response (±1.5db) . . . Sylvania Electric Products, 1740 Broadway, New York, N. Y., offers an automatic reset fluorescent **lamp starter,** FS6-NA, for 85, 90, 100-w lamps. The two-pin starter automatically cuts out a blinking light and resets for normal operation.

Super-Grip Anchor Bolt Co Inc, Philadelphia 40, Pa has a pipe bolt **anchoring assembly** said to provide 50% greater anchorage for mounting conduit or pipe to masonry. Assembly consists of eye bolt, lead sleeve and patented steel anchor. After inserting the lead sleeve is mushroomed by a special tamping tool . . . Furnas Electric Co, Batavia, Ill, has a rotating **limit switch** to limit travel of rotating machines and equipment. The switch coordinates reversing operations with the motor shaft rotation, timing governed by a pre-set member of shaft revolutions. Cast aluminum case 6⅛ x 4¾ x 5⅜, operating shaft extends 2¼ in. from case.

Thomas A. Edison Inc, West Orange, N. J., has a compact lightweight **dictating machine** which can be carried in a briefcase, weighing 12 lb, measuring 11⅛ x 9⅞ x 2⅞. It operates on 115v 60 cps at 25w. Recording time on 7-in. plastic disc is 30 min. . . . Steber Mfg Co, Broadview, Ill, has six new cast aluminum **utility lamps** Series 9, for PAR-38 and R-40 lamps. They are designed for outdoor areas where extreme moisture and salt air are encountered, and the universal adjustment provides for beam aiming.

in this modern dairy plant

Grade A

SPANG® CENTRAL CONDUIT was a natural!

In H. P. Hood & Sons dairy plant the emphasis is necessarily on rigid standards of cleanliness and efficient, dependable operation.

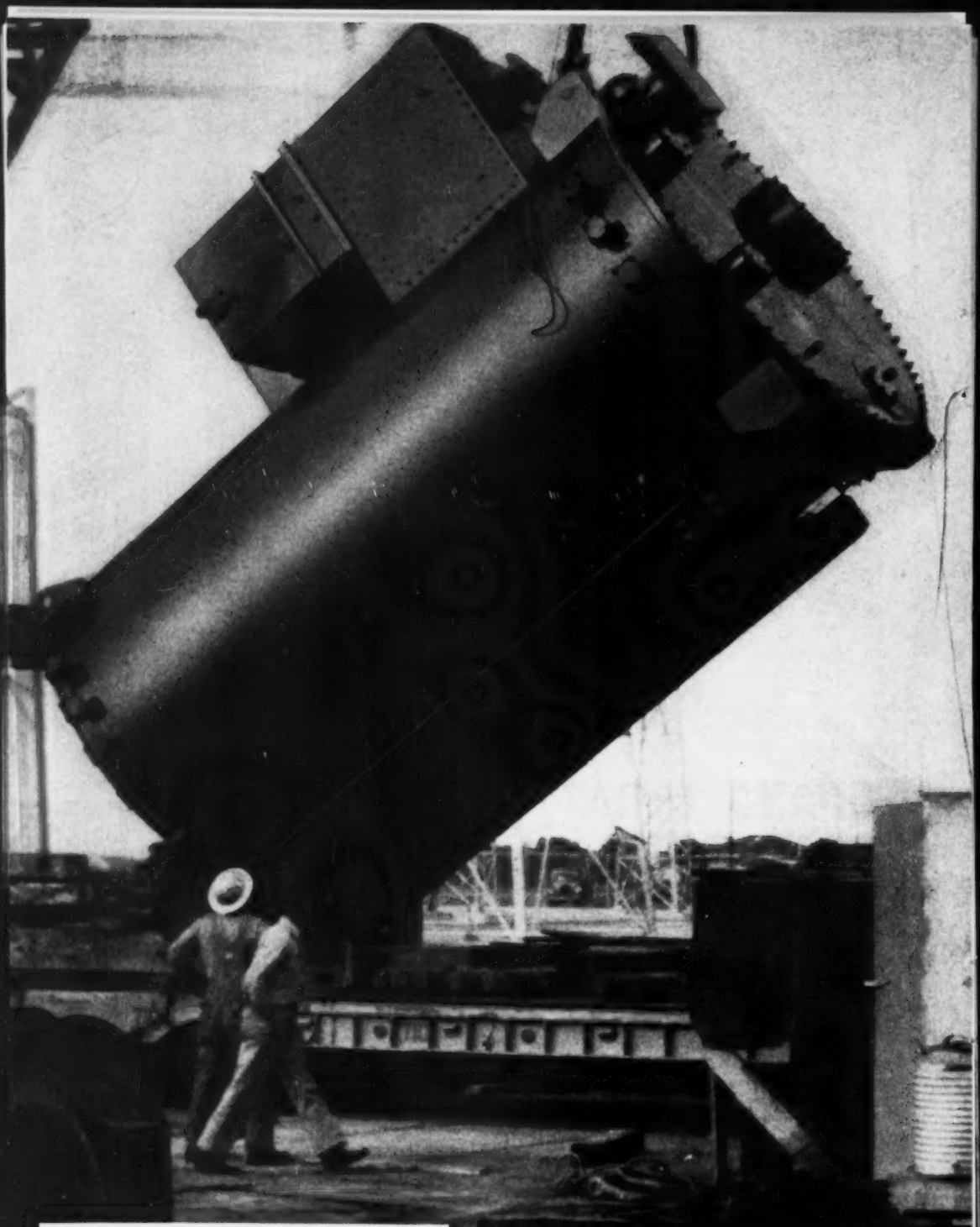
It was only natural that in designing their Boston plant for the production of Grade A dairy products, H. P. Hood & Sons selected only Grade A materials. Which makes significant their choice of Spang Central Conduit . . . for control systems and many other needs in their original plant, as well as in the numerous additions which have been made during the past several years.

Spang Conduit is well suited for rigorous conditions. At H. P. Hood, for instance, they find the outside wall never chips or flakes even when forming difficult bends . . . remains watertight and always dependable through continual scrubbing and other sanitary techniques. All of which results in complete, life-time protection for all their electrical circuits.

This is but one more example of the reliance that prominent architects, contractors and owners place in the quality-controlled conduits by Spang—"Cenlaco", "Central White", "Central Black", and "Central EMT". Wherever reliability is a must, faster installation important, you'll find Spang Central Conduit with its easier bending, threading and cutting characteristics is the best that money can buy.

OWNER: H. P. Hood & Sons Company, Boston, Mass.
ELECTRICAL CONTRACTOR: M. B. Foster Electric Company, Boston, Mass.
GENERAL CONTRACTOR: William M. Bailey Company, Boston, Mass.

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE
PITTSBURGH 30, PA.
District Offices and Sales Representatives in Principal Cities



One of seven single phase corona-free transformers of Southern California Edison Company's substations. Each unit is rated 30,000 kva, 127.1/220 kv — 72 kv with load ratio control in the low voltage winding.

CORONA-FREE DESIGN

PRESCRIPTION for LONG TRANSFORMER LIFE:

CORONA DESIGN

INSULATION THAT COULD LAST for years deteriorates under the impact of corona. By charring insulation and making it conductive, corona progressively steals life from your transformer.

WHAT ABOUT CORONA-FREE DESIGN?

Corona-free design prevents corona from forming even at the highest test voltages. Your transformer keeps full insulation strength in windings, tap changers, terminal boards and other parts because they are kept free from corona's injurious effects.

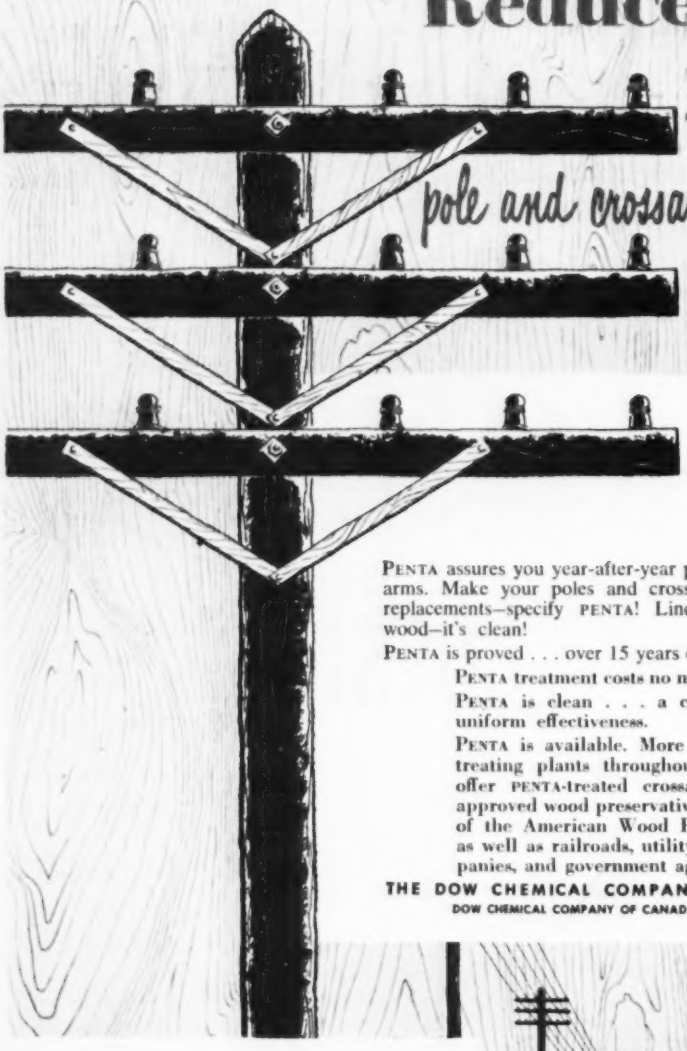
Allis-Chalmers corona-free design removes an obstacle to long transformer life. For the years ahead it provides the strength and performance you originally specified. It keeps your transformers young. Allis-Chalmers, Milwaukee 1, Wisconsin. A-3799

ALLIS-CHALMERS

KEEPS TRANSFORMERS YOUNG

Reduce

pole and crossarm replacement with penta*



PENTA assures you year-after-year protection for poles and crossarms. Make your poles and crossarms last longer and reduce replacements—specify PENTA! Linemen like PENTA-PROTECTED wood—it's clean!

PENTA is proved . . . over 15 years of unsurpassed service records.

PENTA treatment costs no more.

PENTA is clean . . . a chemical of constant, uniform effectiveness.

PENTA is available. More than 60 commercial treating plants throughout the United States offer PENTA-treated crossarms and poles. An approved wood preservative, PENTA is a standard of the American Wood Preservers Association as well as railroads, utility and telephone companies, and government agencies.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

DOW CHEMICAL COMPANY OF CANADA, LIMITED, TORONTO, ONTARIO

Write *to Dow for*

- ☐ *Booklet "Pointers on PENTA"*
- ☐ *Source for PENTA-treated Poles*
- ☐ *Source for PENTA-treated Crossarms*
- ☐ *Source for PENTA-treated Construction Lumber*

The Dow Chemical Company
Dept. PE 7A • Midland, Michigan

Name_____ Title_____

Company_____

Address_____

City_____ State_____

LETTERS TO THE EDITOR

Costs of House Heating Fuels Compared

To the Editor:

The May 5 issue carried an article, "Consolidated Edison Checks Up on Electric House Heating," by A. L. Carroll and B. J. Nimphius. This article develops the factor of 0.335 kwhr per Btu per hour heat loss. It also states that all results were adjusted to a heating season of 5,090 degree days.

The August 1952 issue of "Gas Heat," Vol. III, No. 8, carried an article, "Gas Over Oil," written by A. L. Carroll. This covered tests of 107 domestic heating installations in Westchester County, New York, 51 fuel oil and 56 gas. The results of these tests were adjusted to a heating season of 5,090 degree days. The following comparison between gas and oil is based upon the amount of fuel required per 1,000 Btu heat loss:

2,100 cu ft of 1,055 Btu natural gas or 22.14 Therms

22.5 gallons of 140,000 Btu oil or 31.5 Therms

These tests indicate that the oil burning equipment is 70.3% as efficient as gas or 42% more oil heating units are required than by gas.

If we take the results of these two articles and combine them, we discover interesting facts. The following table is based on the amount of fuel required per 1,000 Btu heat loss:

Oil: 31.5 Therms, 22.5 gals (140,000 Btu), @ 13¢/gal = $2.93

Gas: 22.14 Therms, 2,100 cu ft (1,055 Btu), @ $1.40/1,000 cu ft = $2.94

Electricity: 11.44 Therms, 335 kwhr (3,415 Btu), @ 2¢/kwhr = $6.70

If we assume that the electric heat operates at 100% efficiency, then this tabulation indicates that gas operates at 50% efficiency and oil at about 36% efficiency. It also appears that 13¢ oil is equal to $1.40 gas and 2¢ electricity is more than twice the cost of gas or oil.

This is, of course, a comparison of Btu costs only. It does not take into account other costs which must be added to arrive at a true evaluation of the relative merits of the three heating methods.

W. A. Sherman
Industrial Heating Engineer
The Narragansett Electric Co
Providence, R. I.

Grounded Distribution

To the Editor:

We read with much interest your first item under "Technical Notes" in Electrical World of August 25. Your statements are correct.

We have operated a 4,160-v grounded-neutral system for the last 12 years and 2,300-v delta for the 20 years between 1940 and 1920. We operated a 2,300-v delta city distribution, as an experiment, with one wire grounded for about three months. The telephone people have to keep their circuits in good order under these conditions. Small wire primaries have to have 29 in. spacing on 4,160.

There is one thing I would like to have you check on. We use relatively quite a lot of aerial cable both three and single phase on this 4,160-v star system and have had excellent results, or no damage from lightning in the seven years since the first installation. There are three cases I know of in South Carolina where aerial cable has burned down in the last few years. In every instance the system using this cable was delta-connected.

My theory is that the capacity or shadow ground that is the nature of a delta system causes an arc or trouble that is not inherent in the grounded system. Delta systems are noted for their wonderful arcs anyway.

F. W. Chapman
Engineer and Manager
Commissioners of Public Works
Greenwood, South Carolina

• Any other theories?

2 More New Plants

To the Editor:

In your Sept. 22 issue, we noticed that under New Generating Facilities to Be Installed, 1952-55, no reference was made to our new Urquhart Steam Plant, which is located near Beech Island, S. C. The initial installation will consist of two 75,000-kw units and will be completed in 1953.

The South Carolina Public Service Authority (Santee-Cooper) also has under construction a new steam plant, which is located adjacent to its hydro plant near Pinopolis, S. C. This plant will have an initial installation of two 40,000-kw units, and we understand that their completion date will also be in 1953.

F. R. McMeekin
Vice President
South Carolina Electric & Gas Co
Columbia, S. C.

Production for Freedom

To the Editor:

Congratulations on your PRODUCTION FOR FREEDOM issue—of the publications we have received which included Production for Freedom stories, we certainly feel that the Electrical World treatment was the most outstanding.

The single copy we received was passed to so many people within the company that it is pretty dog-eared and shop-worn. If you have an extra copy, I will appreciate your sending it to me.

F. C. Hersh, Supervisor
Sales Planning & Promotion
Pennsylvania Power & Light Co
Allentown, Pa.

• Because of the great demand for this 12-page electric heating feature from the Sept. 8 issue, reprints are now available at $10 a hundred.

Double Barrelled Thanks

To the Editor:

I want you to know that we appreciate your editorial appearing in Electrical World of June 2, entitled "A Silly Question."

I want to comment, too, on the editorial from Electrical World on June 16, 1952, entitled "It Can Happen Here, Too," because it is already happening here. We agree with your reasoning. Our company alone sold 84,000 heaters during the year 1951 and over 80,000 of them were major size heaters.

W. Wesley Hicks
Wesix Electric Heater Co
San Francisco, Calif.

• The two editorials referred to discussed some of the potentialities of electric house heating.

LET'S BRING IT OUT IN THE OPEN...

The BIG QUESTION is "Are Preformed Armor Rods the most efficient and economical answer for conductors 4/0 and larger?" Practically every Utility Engineer and Contractor recognizes the merits of Preformed Armor Rods for the smaller conductors, but in some minds, there has been a question or two regarding their application on the larger ones.

However, for British Columbia Electric Company Limited (see opposite page), there is no question. They are using Preformed Armor Rods on their new 795,000-cir mil ACSR conductors. And one Utility after another in this Country is adopting them because of their exclusive and outstanding advantages. Below are listed some Users of "large-size" Preformed Armor Rods.

For details on your specific application, write or telephone Cleveland: EXpress 1-3571.

USER	SIZE ACSR CONDUCTOR	USER	SIZE ACSR CONDUCTOR
Boston Edison Co.	795,000 Cir Mils	New England Power Co.	795,000 Cir Mils
California Electric Power Co.	4/0	New Jersey Power & Light Co.	556,500 Cir Mils
California Oregon Power Co.	795,000 Cir Mils	New York State Elec. & Gas Corp.	636,000 Cir Mils
California-Pacific Utilities Co.	4/0	Niagara Mohawk Power Corp.	336,400 Cir Mils
Central Maine Power Co.	266,800 Cir Mils	Northern States Power Co.	336,400 Cir Mils
Central Power & Light Co.	4/0	Ohio Edison Co.	795,000 Cir Mils
Cincinnati Gas & Electric Co.	4/0	Ohio Power Co.	477,000 Cir Mils
Cleveland Electric Illuminating Co.	795,000 Cir Mils	Oklahoma Gas & Electric Co.	477,000 Cir Mils
Consumers Power Co.	266,800 Cir Mils	Otter Tail Power Co.	266,800 Cir Mils
Detroit Edison Co.	795,000 Cir Mils	Pacific Power & Light	397,500 Cir Mils
Georgia Power Co.	4/0	Pennsylvania Electric Co.	1,033,500 Cir Mils
Gulf States Utilities Co.	336,400 Cir Mils	Portland General Electric Co.	795,000 Cir Mils
Idaho Power Co.	397,500 Cir Mils	Potomac Edison Co.	556,500 Cir Mils
Illinois Northern Utilities Co.	477,000 Cir Mils	Public Service Co. of Indiana, Inc.	477,000 Cir Mils
Indiana & Michigan Electric Co.	556,500 Cir Mils	Rochester Gas & Electric Co.	336,400 Cir Mils
Indianapolis Power & Light Co.	954,000 Cir Mils	St. Joseph Light & Power Co.	4/0
Iowa Power & Light Co.	4/0	Sacramento Municipal Utility Dist.	4/0
Kansas City Power & Light Co.	556,500 Cir Mils	San Antonio Public Service Board	336,400 Cir Mils
Kansas Gas & Electric Co.	477,000 Cir Mils	Sierra Pacific Power Co.	4/0
Kansas Power & Light Co.	266,800 Cir Mils	Southwestern Public Service Co.	397,500 Cir Mils
Los Angeles Dept. of Water & Power	954,000 Cir Mils	Tennessee Valley Authority	397,500 Cir Mils
Louisville Gas & Electric Co.	795,000 Cir Mils	Union Electric Co. of Missouri	795,000 Cir Mils
Lowell Electric Light Corp.	795,000 Cir Mils	Utah Power & Light Co.	397,500 Cir Mils
Metropolitan Edison Co.	556,500 Cir Mils	Virginia Electric & Power Co.	477,000 Cir Mils
Minnesota Power & Light Co.	4/0	Washington Water Power Co.	795,000 Cir Mils
Mississippi Power & Light Co.	4/0	West Penn Power Co.	556,500 Cir Mils
Missouri Public Service Corp.	4/0	Western Light & Tel. Co.	266,800 Cir Mils
Monongehela Power Co.	556,500 Cir Mils	Western Massachusetts Elec. Co.	336,400 Cir Mils
Montana Power Co.	336,400 Cir Mils	Wisconsin Public Service Corp.	266,800 Cir Mils

British Columbia Electric Company Limited, in pioneering their 345-kv transmission line, has most modern installation in the Western Hemisphere. PREFORMED ARMOR RODS will protect the initial single conductor at the support points as well as the dual conductors, illustrated above, which are planned for ultimate installation.

Shown in the picture are, left to right: J. P. Fraser, assistant chief engineer, electrical division; F. O. Wollaston, superintendent of design, engineering division; T. Ingledow, vice-president and chief engineer; J. H. Steede, executive assistant to vice-president and chief engineer; H. W. Smith, assistant chief engineer, engineering division.

PREFORMED LINE PRODUCTS COMPANY

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

CONTROLLING THE POWER OF THE HUNGRY HORSE

As the new Hungry Horse Dam in Montana comes into full operation utilizing the enormous output of its four 71,250 kw generators, the task of controlling the tremendous power over its transmission lines, and the generator output of the power station rests on the instruments and equipment chosen for this duty.

Taller & Cooper detailed, manufactured, assembled and wired the following instrumentation and equipment chosen for the Hungry Horse:

- **Unit Control Boards for each of the four generators**
- **The Main Control Board**
- **The Recording Control Board**
- **The Two Annunciator Cabinets**

Each installation . . . engineered and fabricated to provide maximum service, economically and efficiently.

We suggest you take advantage of our research development staff, and manufacturing methods and facilities to solve your problems. Your inquiry will receive immediate attention.

CONTROL DESKS

RELAY PANELS

PRINTING RECORDERS

ANNUNCIATORS

GAUGE BOARDS

CONSOLES

GAS ANALYZERS

FLASHERS

TALLER & COOPER, INC.
Engineers-Manufacturers
75 FRONT STREET • BROOKLYN 1, N. Y.

POWER CONTROL EQUIPMENT—DIGITAL CONVERTERS AND PRINTERS
WIND TUNNEL INSTRUMENTATION
SPECIAL PURPOSE INSTRUMENTATION
TOLL COLLECTION SYSTEMS—TOLL BOOTHS

ENGINEERED FOR EFFECTIVE PLANT CONTROL

WHAT THEY'RE SAYING

At Industry Meetings

Role of Profit Makers

A. W. ROBINSON, finance committee chairman and director of the Westinghouse Electric Corp, before the National Association of Sheet Metal Distributors at Pittsburgh, Pa.

The men who are able to plan, supervise and operate a business for a profit are the real benefactors of the human race. Profits are the incentive which justifies and encourages men to take the trouble to improve the conditions of their fellow men. Without profits, poor men, no matter how able they were, could never improve their position nor could they ever bring something worthwhile to the attention of the public.

The government should not frown on profits, as it appears to do, since it leans heavily on the profits of business for a large portion of its tax money. Last year corporations alone furnished an estimated $27,000,000,000 out of their earnings and their owners paid further billions out of their portion of the profits that were received.

Business for profit is a game which may need a referee to keep the contestants within the rules, but it is in no sense an evil anti-social activity.

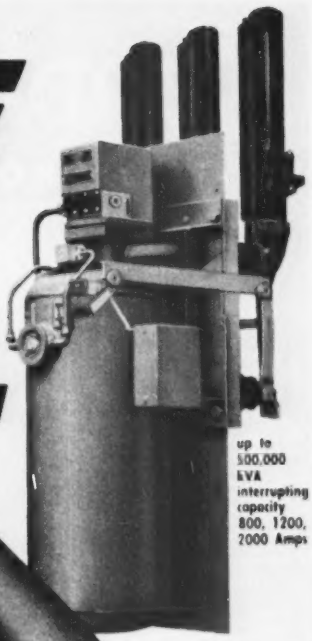
Power, Productivity and Progress

PHILIP D. REED, chairman of the board, General Electric Co, before a luncheon sponsored by the San Francisco Chamber of Commerce and the Commercial Club at San Francisco, Calif.

A trillion kwhr of electric current will be sold in this country by 1965 and this is five years earlier than was planned by my GE associates two years ago. The sales of General Electric should be well over last year's 2.3 billion dollar figure and within the next ten to twelve years our business should double.

As productivity is the foundation stone of progress, electric power is the inevitable foundation stone of productivity. Electric power lengthens the arm of the workman so that a man can produce many times as much of a product, in fewer hours, with less exertion and no greater skill than his

the INSIDE story of the new



up to 500,000 kVA interrupting capacity 800, 1200, 2000 Amps

BROWN BOVERI DRAW-OUT AIR BLAST BREAKERS

Only the *new* Brown Boveri development—the DRAW-OUT AIR BLAST BREAKERS—designed to replace Magnetic Breakers—offers ALL these advantages:

- Self-contained unit adaptable to any cubicle design.
- High Speed Operation (2½ cycles).
- No difficulties when interrupting magnetizing currents.
- No re-strikes on capacity switching
- Will handle purely capacitive loads up to their full current rating.
- Exceedingly small contact wear. (Contacts will stand 100 full capacity interruptions without upkeep or replacement.)
  No arc chutes to be cleaned.
- Control mechanism safely accessible without withdrawing breaker.
- Light weight, easily removable. Immediate accessibility of strategic parts after breaker is withdrawn.
- Reasonably priced, prompt deliveries.

Incorporate all the advantages of Brown Boveri Air Blast Breakers—quality-wise, performance-wise, with minimum maintenance. In short, a superior breaker for the industrial switchgear field.

BROWN BOVERI

BROWN BOVERI CORP.
19 RECTOR STREET, NEW YORK 6, N. Y.

Simple EASY to APPLY!

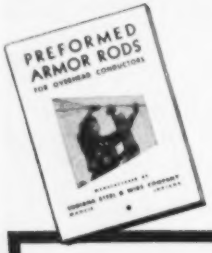
10-WAY PROTECTION

1. Reinforce conductors at supports.
2. Minimize wear and chafing.
3. Protect against flash-overs and arcing.
4. Provide increased holding power.
5. Absorb and dissipate vibration.
6. Eliminate tie and clamp damage.
7. Increase radiation area.
8. Reduce corona losses.
9. Prolong conductor life.
10. Cut overall maintenance expense.

Preformed ARMOR RODS

Tightly grip . . . without clamp or clip!

SAFEGUARD CONDUCTORS AT LOW COST!



PREVENT abrasion and chafing of conductors at the supports and you eliminate a major cause of conductor failure. By completely armoring the conductor against wear at these vulnerable points, **Preformed Armor Rods** prolong conductor life . . . help to minimize service interruption . . . keep down repair costs.

Accurately designed and preformed to prescribed length and pitch to perfectly fit the specific conductors or strand on which they are applied, these spiral rods provide a *simple*, *practical* and *economical* armor protection.

Preformed Armor Rods are quickly and easily applied by hand. Produced in Galvanized Steel, Aluminum Alloy, Copperweld and Bronze.

● *Write today* for your copy of this informative 8-page bulletin fully describing Preformed Armor Rods' purpose, features and application.

Ask your Graybar representative for details!

INDIANA STEEL & WIRE COMPANY
MUNCIE, INDIANA

father. Power and productivity go hand in hand. Although in the United States there is only 7% of the world population, some 40% of the world's power and 50% of the world's goods are produced. American utilities have performed an "heroic task" in keeping abreast and ahead of the nation's rapidly expanding power requirements. The need for productivity is the root of most of the troubles abroad. Production per capita of Great Britain is about 50% of our level, France about 30%, and Italy only 20%.

The Atom in National Defense

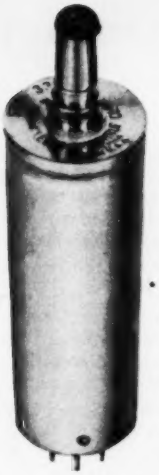
GORDON DEAN, chairman, U. S. Atomic Energy Commission, before the 75th Annual Meeting of the American Bar Association at San Francisco, Calif.

It was a very wise Roman military man named Flavius Vegetius who stated in the fourth century that "he who would desire peace should be prepared for war." It has taken the United States a good many decades and two world wars to learn this basic lesson. But it appears now to be well learned as 85% of the federal budget is now for national defense. The atom is still the principal instrument by which we may destroy or at least severely reduce the ability of an aggressor to make war. The AEC has asked a special appropriation of nearly 3,000,000 dollars over and above our previously allotted funds to increase our capacity to make fissionable materials.

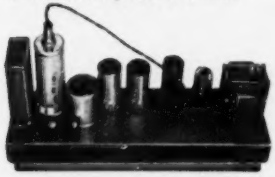
There are other things however in the atomic picture besides preparedness for war. Recently great strides have been made in the use of atomic energy in production of power. Four utility companies have studied our program to determine the feasibility of economical power production from atomic energy. These groups were greatly interested in the fact that nuclear reactors can in theory be built so as to produce both plutonium and power.

Since the government has a demand for plutonium for atomic bombs and since private industry has a demand for power, the simultaneous production of both has an obvious appeal especially from the standpoint of costs. These four groups of companies were in our program, with our cooperation, for more than six months, and recently submitted their reports. Not one was pessimistic.

A lot of engineering for a Component!



Converter's job in Speedomax instruments is to receive the (often very small) direct current signal which is related to the temperature, stress pH or other condition being measured, and produce an alternating voltage. This output is amplified, and then directs the balancing system to measure, record, and if desired control.



Good engineering shows in this Amplifier's thorough filtering, high impedance, and plug-in connection to the rest of the Speedomax.

Good engineering shows in this Slidewire's non-inductive winding and in absence of any flexible leads which might form inductive loops.

Good engineering shows in this balancing motor's small size, and in its torque ample to operate accessory control and signalling fitments.

and every Speedomax user benefits by it!

• The operating precision of the thousands of Speedomax Recorders and Controllers which serve industry and science begins with the engineering of components like this Converter. Our specifications apply at all stages—all the way back to the plants which make metals, insulation materials, etc., for us. These specs represent also the best thinking of our suppliers' engineers. The resulting materials are thus quality-controlled for us—and us alone.

From these materials our engineers tell our factory how to make converter parts to truly tight specifications. Some parts require principally flatness, or elasticity, or dimensional stability. Reeds need correct natural frequency. Many parts of course combine various needs; each gets its requirements.

Life tests show Fidelity and Stamina. Ingenious and often original design creates from these parts a converter with noise level equivalent to only 0.2 microvolt in an emf potentiometer circuit. And this fidelity promotes accurate measurement and control.

Running on life tests since 1948, present-model converters are today still well inside performance tolerances. Such a run equals 21.9 years of 8-hours-a-day, 200-days-a-year-service—or 1.9 years more than the present age of the first Speedomax.

This kind of engineered performance is also built into the amplifier, slidewire, motor and scores of other exclusively Speedomax parts. It's at your service whether you want to control a super heater or record temperature anywhere from coal pile to bus bar. Call on L&N application engineers in selecting the exact range (from among thousands) and the exact measuring circuit (from among 2300) to meet your needs. Write our nearest office, or 4938 Stenton Avenue, Philadelphia 44, Pa.

CAREER OPPORTUNITIES AT L&N

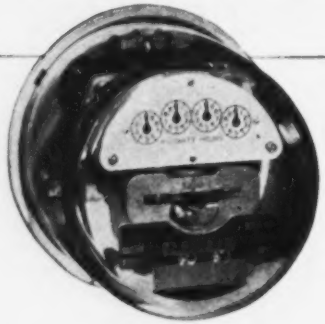
Expansion program of this long-established firm has many features to attract outstanding recent graduates in engineering and science. Opportunities are in sales field engineering, product and application engineering, research, advertising, market development. Widely-respected policies assure recognition of progress and achievement. Address Personnel Manager for preliminary interview at nearest of 17 L&N offices.

LEEDS NORTHRUP

instruments • automatic controls • furnaces

Jrl Ad ND46(64)

What would YOU like to know about metering?

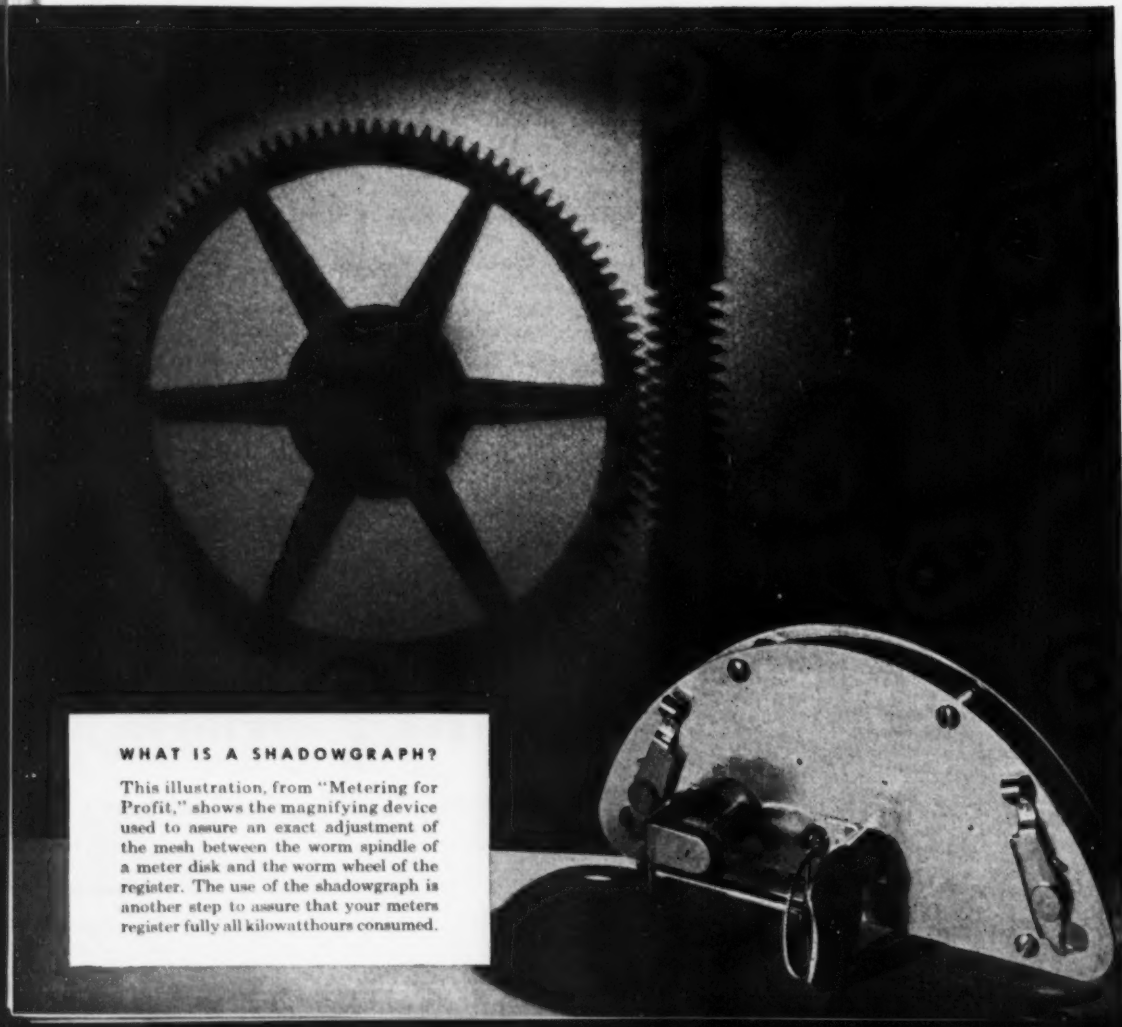


Meters are important to everybody in the Electric Utility Industry — not only because they are the operating components through which every cent of revenue is measured — but, because modern meters can help the industry obtain the maximum benefits in Metering for Profit.

Would you like to know how modern meters can promote good public relations?

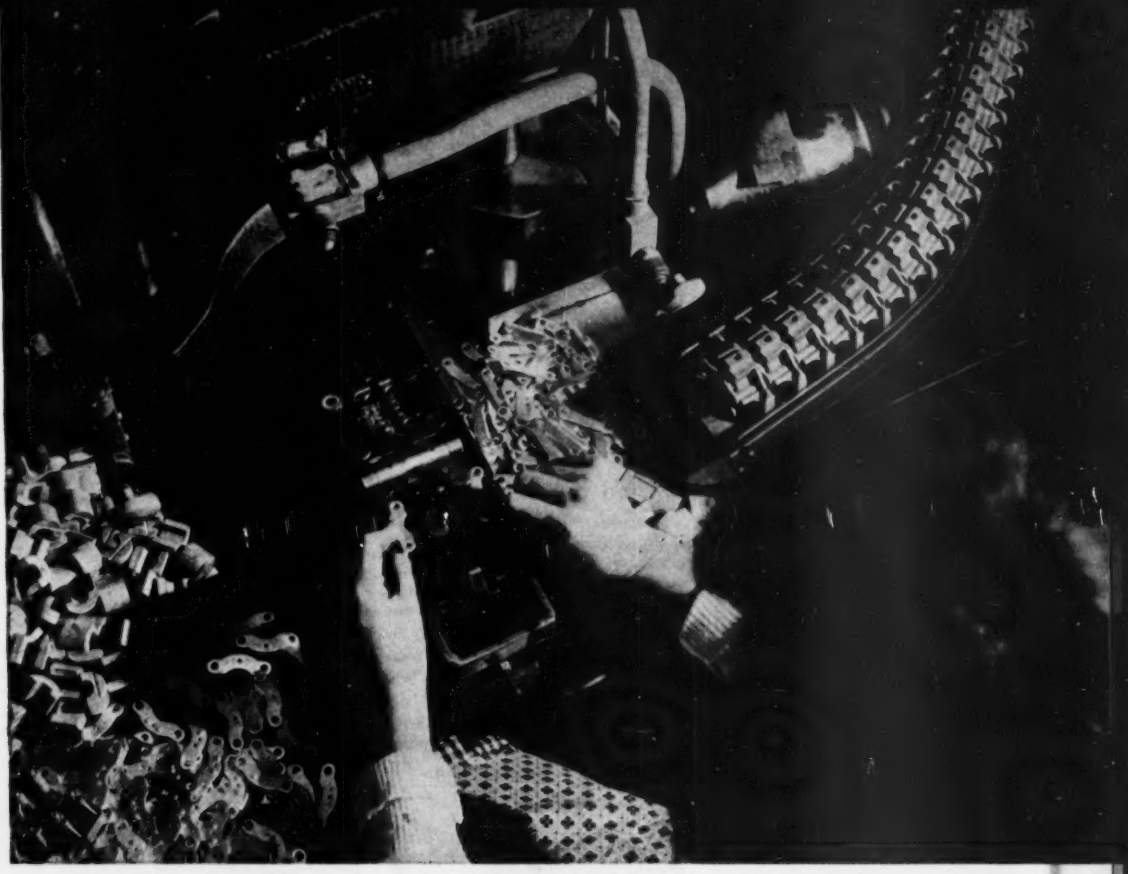
Would you like to know how accurate meters facilitate fair pricing? How dependable meters can reduce operating costs? And, how well-designed meters save operating and maintenance expense for your company?

If you are interested in the answers to these, and many other questions, get your copy of "Metering for Profit". It's yours for the asking.



WHAT IS A SHADOWGRAPH?

This illustration, from "Metering for Profit," shows the magnifying device used to assure an exact adjustment of the mesh between the worm spindle of a meter disk and the worm wheel of the register. The use of the shadowgraph is another step to assure that your meters register fully all kilowatthours consumed.



HOW DO PERMANENT MAGNETS REDUCE HIGH BILL COMPLAINTS?

Damping magnets control the speed of the meter. Accuracy depends on the permanence of their strength. Millions of meters equipped with Alnico magnets have been in operation for years without a report of a single one of them speeding up in service due to loss of damping strength.

Write for

"METERING FOR PROFIT"

A non-technical report to utility company personnel concerning watthour meters. If you are interested in metering and its effect on profits, it should be "must reading". The coupon will assure you of a copy.

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Title_____

Company_____

City and Zone_____ State_____

SM52-10

NEWS ABOUT PEOPLE

Hawley Elected Commercial VP

Southern California Edison announces retirement of Robert C. McFadden, promotion of Joseph R. Brookshire

GEORGE N. HAWLEY

George N. Hawley, former assistant to the president of Southern California Edison Co, has been elected vice president in charge of the company's commercial department. He will succeed Robert C. McFadden, who retires Nov. 1.

Joseph R. Brookshire, administrative assistant, has been named assistant to the president to fill Hawley's former post.

Hawley joined Southern California Edison in 1928 as an industrial heating specialist. He was appointed assistant new business manager in 1935, manager of industrial sales in 1938, sales manager in 1949 and assistant to the president in 1950.

Before 1928 he worked for the J. L. Mitchell Contracting Co, Oxnard, Cal., and Westinghouse Electric Corp, Mansfield, Ohio. He attended the California Institute of Technology.

Retires after 36 Years . . . McFadden has been in charge of the company's commercial operations since 1949. He joined the company 36 years ago, was appointed assistant vice president in 1945 and was elected vice president in 1949.

Brookshire has been a member of the Edison company since 1949. He served as public relations assistant until 1951 and was appointed administrative assistant last year.

Upon his graduation from the University of Michigan in 1941 he entered the Air Force. He served as a bomber pilot in Europe during the war. Returning to Michigan, he was graduated from the law school there in 1946. He practiced law in Detroit until he joined the company.

Elected a Vice President

Robert L. Holt has been appointed vice president of Bowser, Inc, Fort Wayne, Ind. The new vice president has been on the firm's board of directors for the past two and a half years and on the finance committee for the past year and a half. Prior to his present appointment with Bowser, he was vice president of H. M. Byllesby & Co, Chicago, and before becoming associated with this firm was the vice president of Blair, Rollins & Co, Inc, Chicago.

Hendrick D. Middel has been promoted from manager of plant engineering in General Electric Co's manufacturing department at Hanford Works, Richland, Wash., to manager of the utilities and general services department. He replaces **Forrest E. Baker,** who is transferring to the company's Employee and Plant Community Relations Division in New York. Middel has been at Hanford Works since 1946.

Gerard H. Welch has been named to the newly created position of assistant to the manager of I-T-E Circuit Breaker Co's Switchgear Division. Welch will be responsible for all switchboard sales, engineering, and manufacture. He comes to I-T-E from the Navy Department, Bureau of Ships, where he was head of the engineering branch, Nuclear Power Division.

Harold M. Detrick has been appointed manager of manufacturing for Westinghouse Electric Corp's Television-Radio Division plant at Metuchen, N. J. He formerly was general manager and executive vice president of Magnavox Corp.

BPA Advances Jones, Goldhammer

Bonneville Power Administration has announced two key power management appointments. Herschel F. Jones, left, has been appointed as assistant power manager under W. A. Dittmer, Bonneville power manager. Bernard Goldhammer, right, replaces Jones as chief, branch of power requirements. The position of assistant power manager has been vacant since the death of Barclay J. Sickler in 1950.

Jones went to BPA in 1945 from the War Production Board where he was assistant to the director, Office of War Utilities. Goldhammer has been with the administration since 1943.

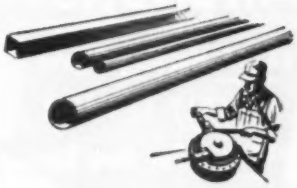
RYERSON

Steel Department Store for Electric Utilities

Here are a few of the many types of steel and related products on hand right now, ready for immediate shipment from your nearby Ryerson plant. Many may be used in place of products that are still hard to get. Check the items you need, and save time by ordering them next time you call Ryerson.

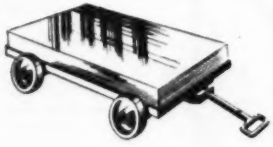
ALLOYS

Tested alloys of known hardenability, both standard and aircraft quality. Complete heat treatment guide with each shipment.



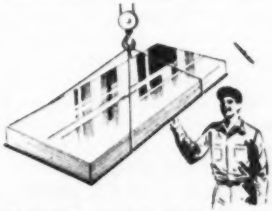
WELDED MECHANICAL TUBING

Hot and cold rolled, rounds and squares in a wide range of sizes. Consider cost. Substitute for seamless tubing.



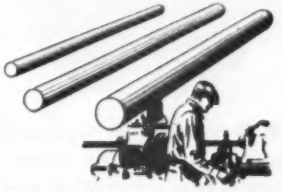
CARBON SHEETS

Both hot and cold rolled coming into better supply, especially cold rolled in the heavier gauges.



STRAIGHT CHROME STAINLESS

No allotment required for these stainless bars, plates and sheets—and they can often replace restricted nickel-bearing types.



TOOL STEEL

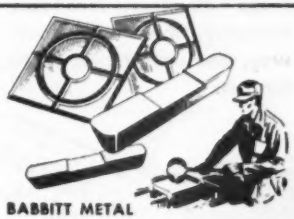
Water, oil or air hardening steel. High in quality; economical in price. Hardening data with every shipment.

SAFETY PLATE

Strong, non-skid Inland 4-Way Safety Plate protects feet against slipping, floors against wear. Easily fabricated.

CHAIN & WIRE ROPE

Rugged, dependable TM chain, iron, steel and alloy qualities, furnished to order. High quality wire rope shipped from large stocks.



BABBITT METAL

Glyco Babbitt, an exclusive Ryerson product, has physicals equal to high tin Babbitts, costs substantially less and is unrestricted.

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JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND • DETROIT PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE EVERSTICK FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA

HOWARD T. BRINTON

Howard Brinton Named Head of Phelps Dodge

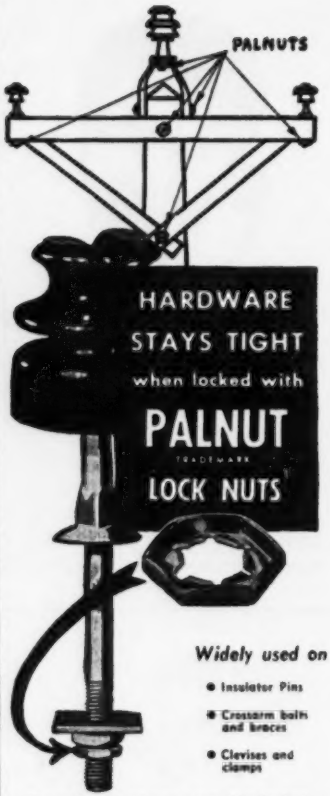
Howard T. Brinton has been elected president of Phelps Dodge Copper Products Corp succeeding Whipple Jacobs, who died Aug. 18 (EW, Sept. 1, p 31).

In other changes W. J. Palmer has been elected vice president in charge of manufacturing and John J. Conlon has been named general superintendent of the Bayway (Elizabeth, N. J.) mills.

Brinton entered the wire and cable business in 1912 when he started at the Yonkers (N. Y.) plant of Habirshaw Wire & Cable Co, predecessor of the present Habirshaw Division of Phelps Dodge. In 1932 he was named sales manager of Habirshaw and in 1937 was elected vice president of the corporation. He is also a director.

Palmer has been works manager of the Bayway plants of Phelps Dodge for a number of years. He previously

W. J. PALMER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HARDWARE STAYS TIGHT when locked with PALNUT TRADEMARK LOCK NUTS
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Every bolt-and-nut assembly locked with a PALNUT Lock Nut stays tight, despite weather, wind, stress and vibration. PALNUTS, tightened on top of the ordinary nuts, prevent loosening and falling off. Very low in cost—easily, speedily applied—require little space—may be used on new or existing assemblies. Heavily galvanized by hot dip process to meet A.S.T.M. Specifications. Stocked by all leading pole line hardware manufacturers.

THE PALNUT COMPANY
51 Cordier St., Irvington 11, N. J.

Also used on steel towers, transformers, disconnects, connectors, voltage regulators, bus fittings, etc.

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Samples and literature on request.

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TRADE MARK
LOCK NUTS

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CHASE ANTIMONIAL ADMIRALTY

(a patented alloy)

If you want condenser tubes that will stand up for years under tough field conditions, remember . . . Chase Antimonial Admiralty* Condenser Tubes last longer! It's the antimony that does it!

These great condenser tubes have enough antimony to resist dezincification. And, in addition, antimony is one inhibitor that will not weaken the tube. The metal starts with the right grain structure and retains it . . . it stays tough and withstands the stresses of heavy duty assignments.

You'll do better with Chase Antimonial Admiralty Condenser Tubes! Send coupon for FREE book on Condenser and Heat Exchanger Tubes.

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Boston	Detroit	Minneapolis	Providence	
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FREE CHASE BOOK discusses corrosion problems and selection of proper alloy for condenser and heat exchanger tubes.

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Utilize the flexibility of

. . . for continuous measurement

Check this Flexibility

- √ *Variety of circuits...potentiometer; Wheatstone, Kelvin and impedance bridges . . . for all power plant measurements, including generator temperatures described on opposite page.*
- √ *Auxiliary switch for audible or visual alarms.*
- √ *Chart speed from ½" to 120" per hour.*
- √ *Selection of models — single-point and multi-point, in choice of printing speeds.*

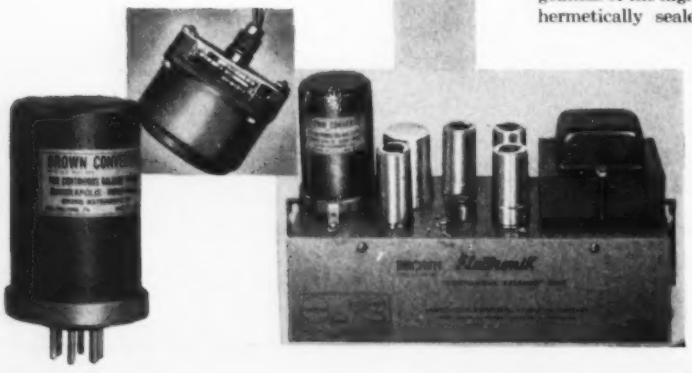
THE flexibility of the entire line of Brown instruments makes available a variety of combinations well qualified to fill the measuring, recording and signalling requirements of any power plant. Use of standard, interchangeable components simplifies maintenance, reduces parts-stocking problems.

Thanks to this flexibility, the *ElectroniK* Recorder is applicable to measuring pressure, flow, speed, pH, conductivity, power, current, temperature . . . the *same basic instrument for all*, with changes only in measuring circuit and sensing element.

Check the flexibility features . . . then call in our local engineering representative for a discussion of how they can add to your operating efficiency.

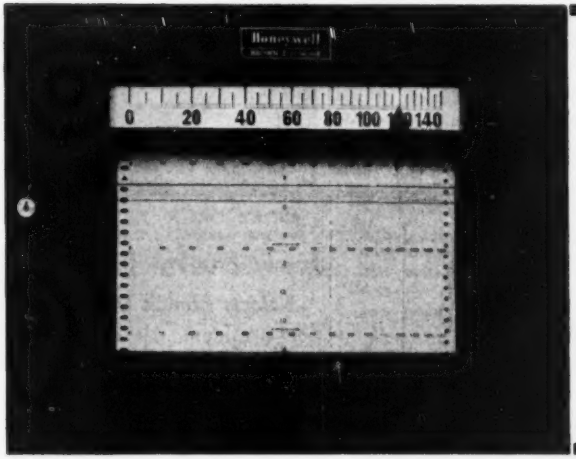
Dependability, Too!

The dependability you demand from your Recording instruments is insured by the *ElectroniK* Recorder . . . by the dependability of its primary components which are life-tested, service-proved and designed for minimum, easy maintenance. You can appreciate at a glance the ruggedness of the high-torque balancing motor, the hermetically sealed converter, the simplified continuous-balance amplifier . . . as well as the minimum of moving parts and the obvious freedom from adverse effects of dust and atmospheric humidity.



ElectroniK Recorders
of generator temperatures

THE *ElectroniK* TEMPERATURE RECORDER



Important Features

- *Continuous Balance measuring system with electronic non-cyclic balancing.*
- *Rotor temperature recorder—Kelvin Bridge type—is calibrated for the individual generator.*
- *Stator temperature recorder works with AIEE standard copper resistance thermometers.*
- *11-inch scale is easy to read at a distance; open, legible chart provides detailed temperature records.*

IF, LIKE MOST power men today, you're squeezing every possible kilowatt from your generators, here's a sure way to prevent overheat damage. Assign *ElectroniK* Recorders to the job of watching generator temperatures . . . and you'll have a continuous, accurate measurement of heat rise that will help you keep within safe limits for insulation.

ElectroniK Recorders are supplied both for rotor and for stator temperature measurements . . . and for countless other power plant temperatures in hydrogen coolers, transformers, cables, cooling oil and bearings.

Service-proved in thousands of industrial installations, the *ElectroniK* Recorder operates on the continuous balance principle. Its unit construction eliminates delicate mechanical linkages . . . assures long, trouble-free operation, minimum maintenance.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4568 Wayne Ave., Philadelphia 44, Pa. Service facilities available in more than 55 principal cities throughout the United States assure prompt attention to maintenance requirements.

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First in Controls

● *Important Reference Data*

FOR MORE DETAILED INFORMATION, WRITE FOR DATA SHEET NO. 9.1-7 . . . AND CATALOG 90-2, "SUPERVISORY INSTRUMENTS FOR POWER GENERATION"

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count these *extras* in...

WEAVER

ground rod clamps

- Cast of high strength electro-bronze specially alloyed in our own electric furnaces.
- Heavy duty Duronze screws furnished with square head or socket type with wrenches at no difference in cost.
- Clamps provide for perfect alignment of rod and ground wire in high pressure contact.
- Clamps fitted with special round pointed screws so that surface of ground rod is not damaged on tightening the screw.
- Weaver Ground Rod Clamps are priced very competitively.

J. A. WEAVER CO.

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served as production manager for Revere Copper & Brass Co, Rome, N. Y., and for Bridgeport Brass Co, which he joined in 1919.

Conlon, production manager of the Bayway plants since 1939, went to Phelps Dodge in 1935 from American Tube Co where he was in charge of cost and production.

FRANCIS O. CASE

New Metal Firm

. . . elects Francis O. Case its first president. He will direct construction of new plant

The newly formed Anaconda Aluminum Co has elected as its first president Francis O. Case, vice president of Anaconda Copper Mining Co since 1948.

Case served as general manager of Basic Magnesium, Inc, Henderson, Nev., during World War II. One of his chief concerns in his new post will be the construction of Anaconda's primary aluminum plant near Columbia Falls, Mont. The plant, scheduled for completion early in 1954, will have two potlines capable of producing 50,000 tons of aluminum annually.

After his graduation from Cornell University, Case spent 29 years with various smelting and refining companies before his appointment in 1945 as assistant to the president of Anaconda Copper Mining Co. In 1947 he was made vice president of Anaconda Wire & Cable Co and in 1948, vice president of Anaconda Copper Mining Co. He is a director of Anaconda Wire & Cable, American Brass Co, and Anaconda Alloys Co. His offices will be in New York.

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RECORDING VOLTMETERS AND AMMETERS

1. Low burden—the lowest burden of any round-chart recorder on the market.

2. Extremely high torque gradient.

3. Temperature compensated.

4. Shock-proof moving element mounting.

5. Leveling of instrument not critical.

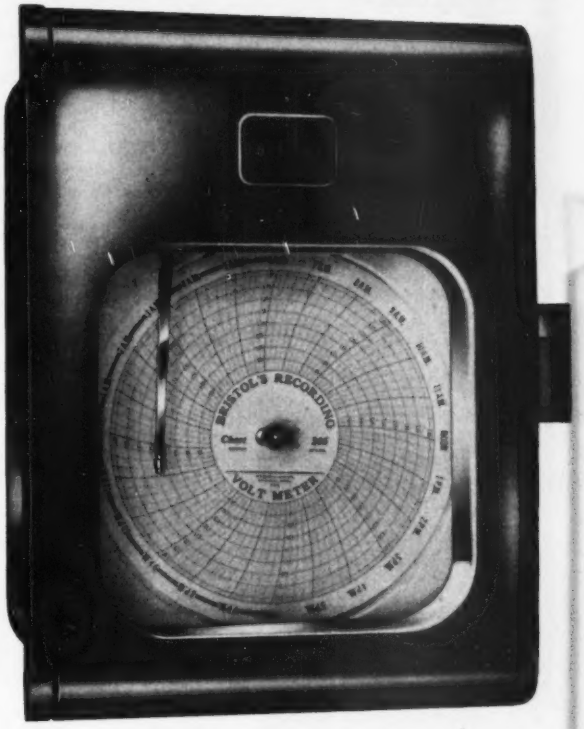
6. Continuously legible recording on sudden changes—up to full scale value.

Bristol Recording Voltmeters and Ammeters use moving-iron measuring mechanisms, known for high torque . . . refined by Bristol engineers for greater accuracy and ruggedness.

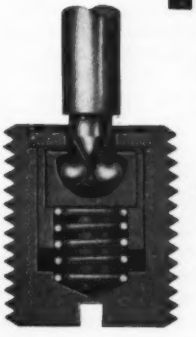
Advances in electrical measurement naturally come from Bristol, experienced for nearly 60 years in building hundreds of thousands of recording voltmeters and ammeters for almost every application . . . the finest, most dependable products.

Series 500 Voltmeters and Ammeters are designed for easy use, with dust- and moisture-proof die-cast aluminum case; quick-set chart hub for easy chart changing; non-obscuring pen lifter; and snap-on chart plate.

Find out all about these superior instruments by writing for Bulletin E1111 to THE BRISTOL COMPANY, (116) Bristol Road, Waterbury 20, Conn.



Permanent mounting offered in three models: interchangeable surface and flush, surface-panel and flush panel. Note the pleasing, well-balanced appearance. Also, *portable instruments* are offered in two models: for setting on floor or table; for mounting on walls or poles and general service.



New ball-bearing suspension, loaded by a coil spring, prevents damage even under severe mechanical shock. Stainless steel bearings and shaft are almost tool hard and are corrosion-resistant.

BRISTOL

The dependable Guidepost of Industry

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

The clean way to safeguard poles, crossarms and other wood construction is the PENTA way. This chemical formula is always the same—deep-penetrating, powerful, long-lasting. PENTA-treated poles last years longer, cost less to maintain . . . and they're *clean*. Write today for names of companies near you supplying PENTA-treated wood products.

CHAPMAN CHEMICAL COMPANY

Dermon Building, Memphis 3, Tenn.

CHAPMAN

Penta Preservative

Conforming to A.W.P.A. Specification P8 and P9

Dr Oliver E. Buckley, chairman of the board of Bell Telephone Laboratories, Inc, has retired after 38 years of service in the Bell system. He served as president of the Laboratories from 1940 until 1951 when he was made board chairman.

Harold F. Rozier, district superintendent at Huntington (W. Va.) for Appalachian Electric Power Co since 1947, has been named assistant system distribution engineer of the utility. Rozier joined Appalachian in 1927.

George E. Tennant has been appointed to the new position of assistant division engineer of Niagara Mohawk Power Corp's Western Division in Buffalo. The utility also named **William C. Widdowfield** to a similar post with its Eastern Division at Albany. Tennant, who served recently with the Central Division, started with Niagara in 1924. Formerly a general engineer with the Western Division, Widdowfield joined Niagara in 1936.

H. A. Bentzinger, electrical superintendent for Iowa Southern Utilities Co's Burlington district, has been named manager of that district. Bentzinger succeeds **J. W. McElroy,** who has resigned after serving the utility for 28 years.

OBITUARY

Stanley A. Kerr, 64, a retired regional planning engineer for the Bureau of Reclamation, died Sept. 17 at Inglewood, Calif. Kerr, who started with the bureau in 1907, was named to the engineer's post at Sacramento in 1941. He supervised work on the Central Valley Project Basin report, retiring in 1950.

Edward W. Florence, 72, former manager of the Pacific Gas & Electric Co's Sacramento (Calif.) Division for 25 years, died at Sacramento Sept. 29. Florence, who joined the utility in 1905, was Sacramento manager from 1920 until his retirement in 1946.

James A. Nichols, 48, district manager for Alabama Power Co at Jackson for the last six years, died at Mobile, Ala., Oct. 7. Nichols had been with the utility for 25 years.

The Model R is now available in 1,500- and 3,000-lb. capacities — other sizes will follow.

Advanced Guard for a New, Advanced Line

Here is a completely new ratchet lever hoist designed to bring you added safety and convenience. The Model R incorporates the time-proved ratchet and pawl principle originated by Coffing — makes it hold positively at all times — no friction-type brake to slip or freeze — chain is free wheeling when not under load.

Many New Advantages

COIL CHAIN Swings or wraps in any direction for greater flexibility in use.

SIX OPERATING POSITIONS Handle operates in any position, works on full or partial strokes — for ease of handling in close quarters. Safety stops prevent spinning of handle.

BIG SAFETY FACTOR All hoist load-bearing parts designed to withstand pull equal to several times rated capacity. Each hoist also factory tested at 100 percent overload. "Safety-valve" handle bends at point of maximum safe overload.

SIMPLE TO SERVICE The Model R may be completely disassembled with only a screwdriver for easy servicing. Not necessary to return it to the factory for repairs.

Find out more about the hoist that gives you greater convenience and safety in all lifting, pulling, stretching. Write for Bulletin E10°.

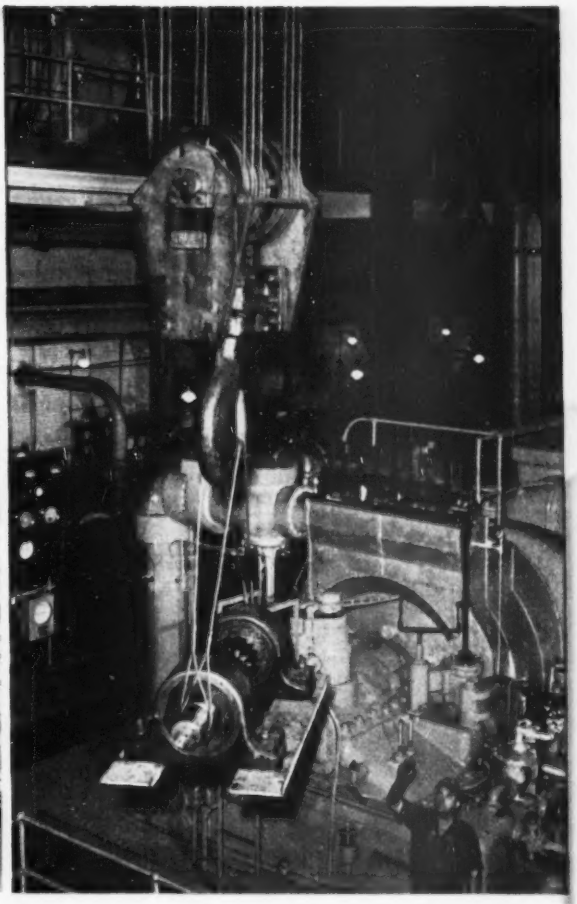
COFFING HOIST COMPANY

Danville, Illinois

Quik-Lift Electric Hoists • Hoist-Alls • Load Binders
Mighty-Midget Pullers • Spur-Geared Hoists
Differential Chain Hoists • I-Beam Trolleys

Sold by Industrial Distributors everywhere

ASK FOR THIS FREE SERVICE



A Technical Study of Your Wire Rope Problems

"Most of our equipment is so specialized!" How often we hear that statement when talking with men in the power-producing field. And they sometimes add, "Our wire rope problems are specialized, too. They cannot be solved by vague, general recommendations."

Agreed! And Bethlehem is fully prepared to give the *specific technical aid* required in choosing wire rope and slings for your equipment.

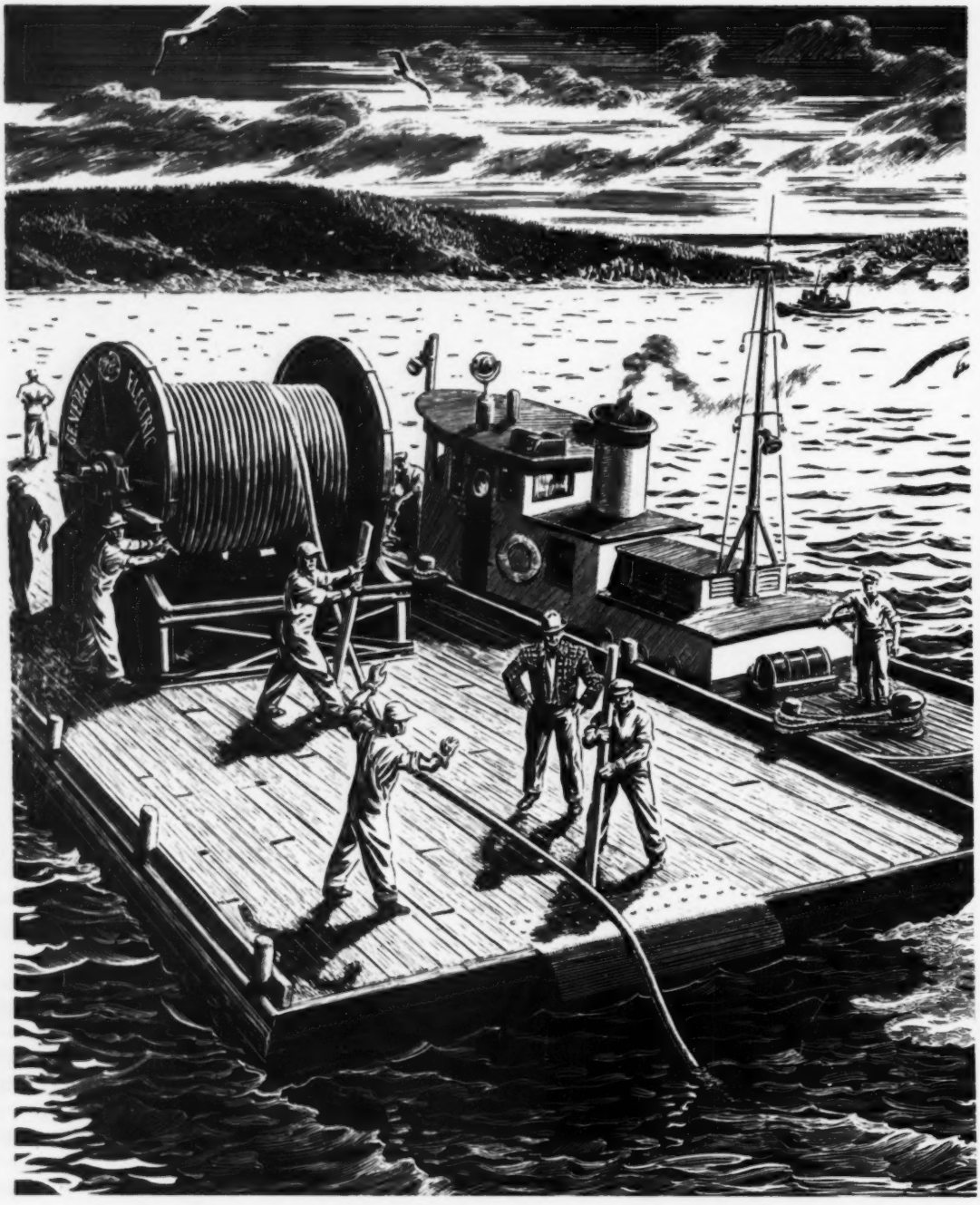
Upon request, Bethlehem will send a qualified engineer to make a full analysis of your rope applications. He will study the machines that are used in your plant. He will check the ropes you have, and if changes are needed, he will frankly tell you so.

These recommendations will not be made hastily, nor lightly. They will be the result of a close, careful review—a study designed to help you get the *most* out of your ropes. For, like your specialized equipment, the wire rope must be specially chosen for the job it has to do. The right rope pays . . . in longer service, lower cost.

If you operate car dumpers, scrapers, ash disposal units, skip hoists, cableways, turbine cranes, or other machinery that uses wire rope, ask Bethlehem for a survey. There is no cost, no obligation whatever. The study should prove as helpful to you as to other power companies that call for this service. Write us for details!

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



To avoid strong tides in Puget Sound, the Peninsula Power and Light Company had to make a quick cable crossing at slack tide. Because General Electric's unique equipment could supply the cable in one unspliced length, the crossing was made before the tide turned.

Equipment and skill at General Electric win race with tide in Puget Sound— make possible laying...

½-mile cable crossing without a splice

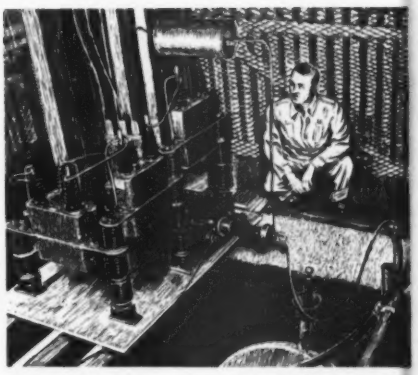
Long cable crossings in Puget Sound are not unusual. But high tides and treacherous currents can make the job tough and costly.

When the Peninsula Power and Light Company of Gig Harbor, Washington needed another 3,100-foot, three-conductor, 15-kv submarine cable installation, they asked General Electric if there wasn't an easier, less costly way to make the crossing. For example, a cable which needed no splicing on the job.

The problem of a 3,100-foot continuous length was easily solved—because of General Electric's remarkable Super Coronol* cable. Unique equipment at General Electric could apply the insulation on Super Coronol cable in a continuous length without splices. The remaining problem was testing this long length for ionization. This testing was made possible because G-E engineers had foreseen the necessity of having special equipment available for applications such as this.

With splices eliminated—either factory or field—and with a cable which is completely impervious to water, yet is far lighter and easier to handle than lead sheathed cable, the electric utility was well on the way toward a simplified cable crossing.

Next, engineers at General Electric helped to plan the laying. G.E. supplied a special reel and cradle particularly adapted for handling submarine cable. And a G-E Wire and Cable specialist was on the spot in case any special problem arose. As a result of selecting Super Coronol, the utility, after one day's preparation on the site, needed only 8 men, a standard scow, and a tug boat to complete the underwater part of the crossing when the tide was slack — shore to shore in just 27 minutes.



This is the special equipment, developed by engineers at General Electric, which tested the 3,100-foot submarine cable for ionization. Ionization testing is a standard G-E practice for every foot of all Super Coronol cable over 5 kv.

Helping to engineer the job right through to completion, as well as furnishing the best cable that modern machines can make, is all part of the service that is available when you call on General Electric. The next time you have a question on cable, telephone or write to your nearest G-E Construction Materials district office or Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

*Registered Trade-mark General Electric Company

You can put your confidence in—

GENERAL ELECTRIC

IGE Expansion Continues . . .

. . . in Brazil despite slowdown caused by the import and exchange limitations, President Herod reveals

RIO DE JANEIRO (McGraw-Hill World News)—Import and exchange limitations are not preventing International General Electric Co. Inc. from expanding manufacturing activities in Brazil, but they are slowing down that expansion, William R. Herod, president, revealed at a recent press conference.

Expansion is being pushed largely along two horizontal lines, Herod said: Expansion of lines already being made, and expansion in manufacture of new items.

Difficulties Slow Expansion . . . This expansion could be accelerated if difficulties with imports and foreign exchange could be solved, he said, urging that everyone work toward a quick reduction of these controls so that trade may be liberalized in the interests of economic development.

Future expansion, Herod indicated, depends on how far IGE can engage in manufacture of components and preparation of raw materials. Horizontal manufacture can be handled by Brazilian labor and skills in Brazilian factories. But this must be supported by importation of materials not yet economical to produce in Brazil—like steel, alloys, chemicals, and other materials.

Progress has been made along these vertical lines, too, Herod added, but indicated that he believed it would be a period of years before Brazil could realize economic self-sufficiency.

Cites Progress . . . He cited one instance of progress along vertical lines: The company is now manufacturing lamps, is making the glass bulbs for the lamps, and is now preparing to make from Brazilian ores the tungsten wires to make the filaments for the lamps. But progressive steps such as these cannot be taken over the whole range of products back to the ore piles, he said.

Expansion is not being helped, either, by the 8% profits remittance limit law, Herod said, pointing out that over a period of 32 years IGE reinvested more than 90% of its earnings in Brazil.

In the last four years of GE sales, Herod added, that 72-75% of the sales have been products made or assembled in GE's Brazil plants, rather than being imported. IGE, therefore, is substantially "a Brazilian industry rather than an importing company."

Harking back to the exchange and import situation, Herod said that other countries, even in Latin America, are worse than Brazil, which is about in the middle. Freest countries, he said, are the U. S., Venezuela, Cuba, Switzerland, and Canada.

Kaiser Starts Operation of Chalmette Power Plant

First power from the steam power facilities of Kaiser Aluminum & Chemical Corp's Chalmette (New Orleans) reduction plant was turned on when the firm added its third potline. The third potline will add another 50 million lb of primary aluminum a year to the nation's production.

Fired by the abundant natural gas resources in the area, the steam plant will develop approximately 370,000 kw of uninterrupted power for the final six of the plant's eight potlines. The steam plant's facilities will use daily more than 100 million cu ft of gas and more than half a billion gallons of water.

Power for the first two potlines is being generated by the plant's radial gas engine facilities, also utilizing natural gas to produce 103,200 kw. Together, the steam and radial gas engine plants have a capacity of 473,200 kw.

Kaiser claims its $150 million Chalmette plant will be the country's largest aluminum reduction plant when in full operation next year. At that time, eight potlines will be in operation, turning out aluminum at the rate of more than 1 million lb per day. The plant will have a capacity of 400 million lb yearly.

New Lighting . . .

. . . experiments are conducted by French scientists at Westinghouse's Lamp Division plant

For the last nine months Westinghouse Electric Corp's Lamp Division has employed Prof Georges Destriau and Dr Joseph Mattler, both of the Sorbonne, University of Paris, France, to continue advanced experiments in electroluminescence—illumination by charging a flat glass panel coated with a phosphor.

Revealed Ideas in '36 . . . According to Edward G. F. Arnott, director of research for the division at Bloomfield, N. J., the two French scientists began exploring the field of electroluminescence in 1935, more than ten years before any American lighting engineers suspected its possible commercial uses. They jointly published basic ideas in 1936, Arnott revealed.

"While electroluminescence is still in its swaddling clothes, producing only a small amount of light and possessing low efficiency under ordinary conditions, we have found our experiments most valuable in learning more about the lighting qualities of phosphors, key materials in fluorescent and fluorescent mercury lighting," Arnott said.

Briefs U. S. Scientists . . . Arnott further explained that the purpose of bringing Professor Destriau here from his Sorbonne laboratories was to give him an opportunity to brief our local scientists on the progress of his work, and to test a new, superior phosphor he has developed for us. Prof Destriau has now returned to Paris to continue his studies as a Westinghouse consultant. His departure followed a months visit to the Bloomfield laboratories.

MANUFACTURING BRIEFS

D. J. Murray Manufacturing Co, Wausau, Wis., has now completed a new two-story brick addition. The addition, 126 by 115 ft, was formerly dedicated at ceremonies held in September in conjunction with the company's 70th anniversary.

HERE'S PROOF

1 lb. of copper will do the work of 1.6 lbs. when you use

Hi $I = \frac{E}{R}$

Your best buy

ROCKBESTOS A.V.C.®

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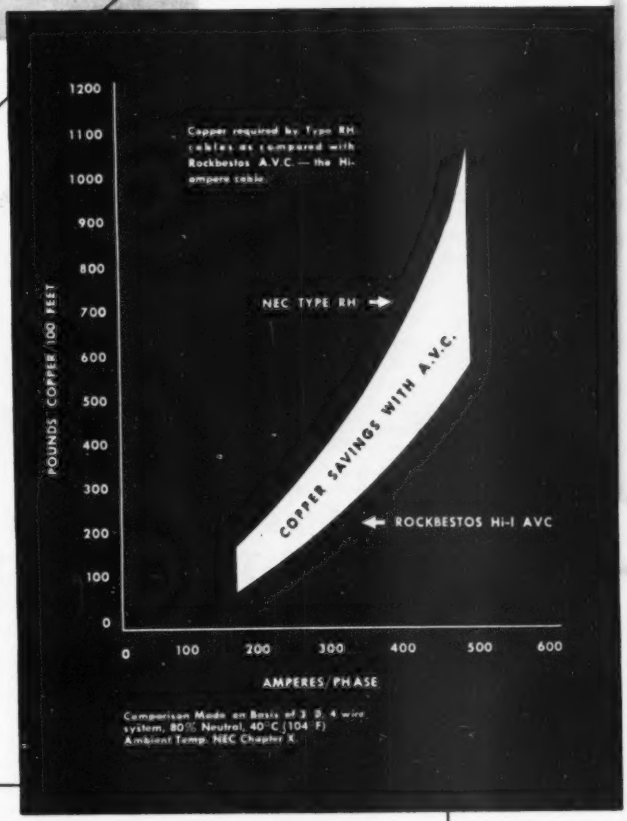

Size for size Rockbestos A. V. C. carries more current than ordinary cables. And that's why it makes your critical copper and steel go farther.

You always use a smaller cable with Rockbestos A.V.C. Smaller cable requires less copper and smaller conduits and fittings on your power circuits. You save copper — save steel — save time and money.

Where voltage drop and power losses are critical, proper engineering allowances should be made.

Call your Rockbestos Application Engineer *today*. Ask for a copy of "Rx for a Building with Hardening of the Arteries."

ROCKBESTOS PRODUCTS CORPORATION

NEW HAVEN 4, CONNECTICUT

NEW YORK · CLEVELAND · DETROIT · CHICAGO · PITTSBURGH
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The 7-Range Clip-On Volt-Ammeter

FERRANTI

Offers These Important Advantages

- Measures up to 1000 amps—up to 600 volts.
- Convenient ONE HAND operation —trigger action.
- Thumb operated range selector switch.
- 7 ranges—5 current and 2 voltage.
- Insulated core—shockproof construction.
- Takes cables up to 2⅛" diameter.
- Distinct calibrations—easy to read.
- Suitable for 50-70 cycles.

RANGES: 0-10 amps; 0-25 amps; 0-100 amps; 0-250 amps; 0-1000 amps; 0-150 volts; 0-600 volts.

FERRANTI ELECTRIC, INC.
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TEL-E-LECT "325" Attachment . . . Derrick and Digger Unit

For ¾ and 1-TON TRUCKS

Why send a five man truck and crew on pole repiacement or service jobs that can now be handled by two men and a highly portable ¾ or one ton service truck? The "325" attachment makes it possible for two men to set up the derrick, attach the digger, dig the hole and set the pole ready for tamping *in less than ten minutes*! This set-up, with or without radio communication, speeds up line work and cuts costs way down.

Write for Bulletin 325.

★ **No more using five-man crews on two-man jobs**

★ **Sets poles up to 35'; take augers 8" to 20" diameter**

★ **Packaged unit for installation by your local mechanic**

TEL-E-LECT PRODUCTS, INC.
10,003 MINNETONKA BLVD. • MINNEAPOLIS 16, MINN.

Sylvania Electric Products, Inc, recently dedicated its new multi-million dollar Electronics Division headquarters at Woburn, Mass. The 50,000-sq ft plant is headquarters of the administrative, sales, engineering, and manufacturing staffs of the division and is site of principal manufacturing operations.

Westinghouse Electric Corp has shipped a 5,000-kw simple open-cycle gas turbine from its South Philadelphia Works to the West Texas Utilities Co. The unit, 42 ft long and 10 ft wide, will be installed at the company's generating station at Fort Stockton, Tex.

SALES ASSIGNMENTS

COMPANY STAFFS

Graybar Electric Co, New York, has given the additional title of manager, communication sales to D. R. Edge, who has served as manager, goverment sales at Washington, D. C. Prior to joining Graybar in 1945, Edge managed electric cooperatives in Pennsylvania and Ohio.

Libbey-Owens-Ford Glass Co has shifted Arthur S. White to Chicago. Originally assigned as sales representative of the company's Fiber Glass Division in Kansas City, White will make his headquarters at 120 South LaSalle St.

Reliance Electric & Engineering Co, Detroit, has appointed Robert T. Jennings as a sales application engineer in its Detroit district office.

Babcock & Wilcox Co's Tubular Products Division has put J. Y. McCandless in charge of its newly created district sales office located in Syracuse, N. Y., at 205 Harrison St. With the B&W division since 1937, McCandless has been on the technical staff of the company's general sales office at Beaver Falls, Pa., for the past 12 years.

Wagner Electric Corp, St. Louis, has appointed Arthur H. Beasley as manager of its Memphis sales branch. Beasley, who has been serving in the Chicago branch, succeeds A. Callaway Allen, who recently became sales manager of Wagner's Electrical Division. Beasley joined Wagner in 1936.

REPRESENTATIVES

Porcelain Products, Inc, Parkersburg, W. Va., has added the following representatives to cover the western part of U. S.: Garland-Affolter Engineering Co, 58 Sutter St., San Francisco, will cover northern California, including Fresno. Shaffer & Nelson, 1204 Northwest Glison St., Portland, will cover all of Oregon and Idaho and portions of Montana and Washington. The firm has assigned a new representative for the entire states of Minnesota and North Dakota and that portion of South Dakota east of the Missouri River. The representative is Electrical Jobbers Equipment Co, 501 Fourth Ave., South, Minneapolis.

Automatic Control

—of Mixed Bed Demineralization and Silica Removal by Ion Exchange Resins

• Permutit motor operated valves make regeneration of the Mixed Bed Demineralizer completely automatic. This gives more positive control . . . eliminates the dangers of costly human errors—and takes less time . . . saves man-hours formerly spent in regeneration. In a recent installation for a 1450 psi boiler, two compact Permutit Mixed Bed units fill all make-up requirements . . . supply demineralized, silica-free water continuously and automatically—even if one unit is out of service. What better way to eliminate boiler scale and silica deposits on turbine blades!

MINERAL IMPURITIES REACH VANISHING POINT

An almost infinite number of separate ion exchange steps take place simultaneously in the homogenous mixture of anion and cation exchangers. Result—mineral content so low that conventional water analysis methods cannot determine the minute quantities remaining. The effluent of a Permutit Mixed Bed Demineralizer has contained *total* electrolytes of less than 0.1 ppm . . . and silica below 0.01 ppm! (Most commercial distilled water contains 10 to 50 times more electrolytes . . . costs much more to produce.)

TWO AMAZING RESINS DO THE JOB

Highly efficient Permutit Q and Permutit S do the whole job under positive automatic control in the Mixed Bed Demineralizer. Permutit Q is a high capacity hydrogen cation exchange resin that is extremely resistant to wide pH ranges, high temperatures, and oxidizing conditions. Permutit S, a strongly basic resin with a high reaction rate, reduces silica to a range far lower than previous methods.

New Booklet—DEMINERALIZATION BY ION EXCHANGE

This interesting new bulletin describes the key methods of demineralizing water and removing silica by ion exchange.

For your copy, write to: The Permutit Company, Department ME-11, 330 West 42nd Street, New York 36, N. Y. or the Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.

PERMUTIT®

The sole manufacturer of all types of cation and anion exchangers and equipment.

THE PERMUTIT COMPANY, Dept. EW-10, 330 West 42nd Street, New York 36, N. Y.

Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.

ION EXCHANGE AND WATER CONDITIONING HEADQUARTERS

DO THOSE PLOWED-FIELD JOBS THIS WINTER
While the ground is frozen!
NO CROP DAMAGE • NO MUD • BETTER PUBLIC RELATIONS

PENGO EARTH AUGERS

★ Twin helix—no back thrust!
★ Bores true, clean holes in any soil, most sandstones and hardpans, frozen ground, permatrost!
★ All wearing parts replaceable on job!
★ Made in 15 sizes, 10" to 54" hole diameters, to fit all makes of heavy-duty earth boring machines. Larger sizes on order.

PENGO CUTTING HEADS

★ Easy installation — welds to your present helix.
★ Bores where you never could before!
★ Wearing parts replaceable on the job, interchangeable with PENGO Auger parts.
★ Made in 9 sizes, 8" to 24" diameters. Larger sizes on order.

PENGO ANCHOR AUGERS

Specially designed to bore holes for expanding anchors. 3-flight helix carries dirt out fast — completes hole with **half** the usual trips down and up! In 9", 11" and 13" sizes for 8", 10" and 12" anchors. Parts and features same as PENGO Augers.

PENGO BUCKET CUTTERS

Fast-digging PENGO Auger helix to weld to your present bucket bottom hinge. Available for buckets 16" through 36" in diameter. Offers same money-saving features as PENGO Augers.

"Get the PENGO WISDOM TOOTH"

It knows how to bore holes"

Quick-replaceable, drive-on *PENGO Wisdom Teeth are cast from special abrasion and shock-resistant steel alloy; give **far longer** service life! Used on all PENGO Augers and Cutting Heads.

ORDER NOW. SEND FOR LITERATURE. PRICES

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Manufacturers
Santa Clara, California

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INDOOR BUS SUPPORTS

prompt shipment
uniform high quality
easily altered or replaced

Fabrication from unit assemblies of components insure early delivery dates and uniform quality.

3E Bus Supports come in a wide range of styles and sizes for bar cable or tube conductors in flat or 1¼" pipe mounts, for voltages up to 23,000 volts.

For full data ask for New Bulletin 226

ELECTRICAL ENGINEERS EQUIPMENT CO.
Melrose Park, Illinois

New Electrical Construction

New electrical construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included.

UTILITIES

Proposed Construction

Ala., Birmingham—Birmingham News Co. (WSGN) 2200 First Ave. N., television station, $496,000. George E. Gautney, Warner Bldg., Wash., D. C., consult. engr.

Ark., Little Rock—Little Rock Telecasters, Inc., Lee and McKinley Sts., 1 story, concrete block structure and installing television equipment. $211,500.

Ill., Red Bud—City, Conrad F. Becker, mayor, Red Bud, power plant imprvs., incl. diesel engine generating unit 975 kw to 1200 kw, auxiliaries, equipment foundations building rehabilitation and all appurtenances, Russell, Axon & Assoc., 408 Olive St., St. Louis 2, Mo. engrs.

Mass., Boston—Westinghouse Electric Corp., Sturtevant Div., Damon St., plant addn., Damon St., $1,250,000 Charles T. Main, Inc., 80 Federal St., Boston, consult. engr.

Mich., Coldwater—A. N. Langius, dir. State Bldg. Dpt., Lansing, power plant imprvs., altering ash handling sys., turbine drive for draft fan and related work, furnish air compressor, boiler feed water treatment sys., new deaerating feed water heater, addnl. sodium zeolit water softener, Coldwater State Home and Training School, Cummins & Barnard, Inc., State Savings Bank Bldg., Ann Arbor, engr.

Mich., Jackson—WIBM, Inc., 2511 Kibby Rd., television station, $487,000, George C. Davis, Munsey Bldg., Wash., D. C., consult. engr.

Minn., Rochester—Southern Minnesota Co., 100 First Ave. Blvd., television station, $241,000. Jansky & Bailey, National Press Bldg., Wash., D. C., consult. engrs.

Missouri—Southwestern Power Admin., Petroleum Bldg., Tulsa, Okla., 161/69 KV 15,000 KVA sub-station, No. 14-02-001-507, $100,000.

Mo., Kansas City—Midland Broadcasting Co., 222 W. 11 St., television station, $611,000, Jansky & Bailey, National Press Bldg., Wash., D. C., consult. engrs.

Neb., Omaha—Herald Corp., 14 and Dodge Sts., television station, $838,000. Jansky & Bailey, Natl. Press Bldg., Wash., D. C., consult. engrs.

N. H., Manchester—Radio Voice of New Hampshire, Inc., WMUR Bldg., television station, $288,000. Jansky & Bailey, Natl. Press Bldg., Wash., D. C., consult. engrs.

N. J., Lyons—Veterans Admin., Munitions Bldg., Wash., D. C., electrical distr. system addns., for Veterans Administration Hospital, Proj. 3-4114.

N. Y., Albany—Hudson Valley Broadcasting Co., Inc., 204 Washington Ave., television station, $365,000. McIntosh & Inglis, Wyatt Bldg., Wash., D. C., consult. engrs.

N. C., Charlotte—Broadcasting Co. of the South, 112 S. Tryon St., television station, $663,000. Jansky & Bailey, Natl. Press Bldg., Wash., D. C., consult. engrs.

North Dakota—Bureau Reclamation Dpt. Interior, Bismarck, antenna towers, hutments and underground telephone lines for above radio station, Missouri River Basin Proj., Spec. 600C-104.

O., Lancaster—The Diamond Power Specialty Corp., Lancaster, electronics plant industrial television sets, $260,000.

O., Youngstown—Vindicator Printing Co., (WFMJ), Vindicator, television station, $971,000. James C. McNary, Natl. Press Bldg., Wash., D. C., consult. engr.

Pa., Allentown—Penn-Allen Broadcasting Co., (WFMZ-FM), Masonic Temple Bldg., television station, $160,000. Commercial Radio Equipment Co., 1319 F. St., N. W. Wash, D. C., television station, $160,000.

R. I., Providence—Cherry & Webb Broadcasting Co., (WPAO), 24 Mason St., television station, $1,000,000. James C.

McNary, Natl. Press Bldg., Wash., D. C., consult. engr.

South Dakota—U. S. Eng., 1709 Jackson St., Omaha, Neb., sewer, water and power facilities at administration bldg., Gavins Point Reservoir Proj., near Yankton, Inc. 25-066-53-109.

South Dakota—Black Hills Electric Cooperative, Custer, 322 mi. rural distr. lines with the contractor furnishing approx. 10% of material in Meade, Lawrence, Pennington, Custer and Fall River Counties. $275,000.

Tenn., Knoxville—Civil Aeronautics Admin., Dpt. Commerce, 50 Seventh St., N. E. Atlanta 5, Ga., airport surveillance radar facility at McGhee-Tyson Airport, Proposal No. 23-70.

Tex., San Antonio—Sunshine Broadcasting Co. (KTSA), Avenue E at 3rd St., television station. $863,000. Jansky & Bailey, Natl. Press Bldg., Wash., D. C., consult. engrs.

Va., Richmond—Richmond Newspapers, Inc. (WRNL), 111 N. Fourth St., television station. $721,000. Jansky & Bailey, Natl. Press Bldg., Wash., D. C., consult. engrs.

W. Va., Huntington—Greater Huntington Radio Corp. (WHTM), 1112½ Fourth Ave., television station, $324,000. Jansky & Bailey, National Press Bldg., Wash., D. C., consult. engrs.

Alaska—U. S. Eng., Anchorage, 860 sq. ft. concrete generator bldg. and other AACS facilities at remote receiver site, ENG 95-507-53-14; 5,210 sq. ft. concrete generator bldg. and other AACS facilities at remote transmitter site, ENG 95-507-53-15 both at Elmendorf Air Force Base. Plans deposit $10 each. 4,125 sq. ft. concrete generator bldg., 2 story, 25x68 ft., basmnt., communications center addn. and other AACS facilities at communications center site, Elmendorf Air Force Base, ENG 95-507-53-16. Plans deposit $10.

N. S., Dartmouth—C. J. Connolly, engr., c/o Defence Constr. Ltd., 1032 Gottingen St., Halifax, air electrical building at H.M.C.S. Shearwater, $300,000. Plans deposit $100.

Low Bidders & Contracts Awarded

Louisiana — Westinghouse Electric Corp., P.O. box 868, Pittsburgh 30, Pa. CA. turbo generating unit for power plant for which site is not selected:

Riley Stoker Corp., 99 Neponset St., Worcester, Mass., boilers. Total est. $14,000,000. Louisiana Power & Light Co., (subsidiary of Middle South Utilities, Inc.), 142 Delaronde St., New Orleans, La. Ebasco Services, Inc., 2 Rector St., New York, N. Y., engr.

Mass., Weymouth—Thomas O'Connor & Co., Inc., 230 Main St., Cambridge, Mass. CA. Est. $30,000,000. Unit 6, Edgar Power plant addn., North Weymouth, Boston Edison Co., 39 Boylston St., Boston, Mass.

Mo., Pleasant Hill—Missouri Public Service Co., Ralph J. Green, pres., Warrensburg, Mo. Own Forces. Est. $3,300,000. Power generating station, incl. 27,000 kw. turbo-generator, 200,000 lb. per hr. steam boiler, etc.

South Dakota—Zontelli Constr. Co., Ironton, Minn. CA. $448,543. 410.19 mi. rural distr. lines. Todd Co., Cherry-Todd Electric Co-operative, Box 299, Valentine, Neb. Flahart & Colgan, 607½ St. Joe St., Rapid City, S. D. engrs.

Tex., Floydada—S. R. Duncan, 1915 63rd St., Lubbock, Tex., LB $85,900, electric power plant imprvs. City, Floydada, Tex. Consulting Engineers, Inc., 1641 Broadway, Lubbock, Tex., engr. Bids Sept. 18.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

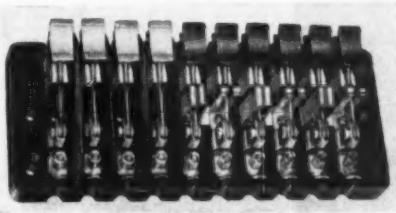
Minn., Minneapolis—Allied Stores, Inc., R. E. Puckett, chn. Bd., 401 Fifth Ave., New York, N. Y., suburban shopping center containing 220,000 sq. ft. branch department store, 75 retail stores, 76 St. and Humboldt Ave. South, Richfield Village. $10,000,000.

Minn., St. Paul 1—Allied Stores, Inc., R. E. Puckett, chn. Bd., 401 Fifth Ave., New York, N. Y., suburban shopping center containing 220,000 sq. ft. branch department store, 75 retail stores, Snelling Ave. and Hy. 36, $10,000,000.

Alta., Edmonton—Barcam Ltd., c/o 1718 W. 5 Ave., Vancouver, B. C., gas absorption plant, $10,000,000.

THE STATES COMPANY

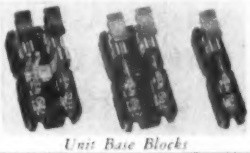
TEST BLOCKS with *NEW* SAFETY GRIP HANDLE



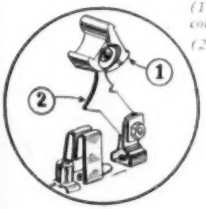
Solid Base Blocks

makes Meter Testing QUICK, SAFE, ECONOMICAL

● States Test Blocks with new Safety Grip Handle automatically assures safer, easier gripping to simplify your testing problems. Angle Blade design eliminates insufficient jaw contact—blade is designed for even, clean jaw contact. Large selection of pole arrangements—no live parts extending beyond base—angle bent studs to permit quick changing of front connection blocks over to back connection . . . all these States features add up to your "best bet" in Test Blocks.



Unit Base Blocks



(1) New Safety Grip Handle available in 12 different colors.

(2) Angle Blade for even, clean jaw contact.

Also, States Blocks meet the E.E.I. and A.E.I.C. Meter Committees Standards.

THE STATES CO.
3 NEW PARK AVE.
HARTFORD, CONN.

THE STATES COMPANY
3 New Park Avenue, Hartford, Conn.

I am interested! Please send me new Test Block Cat. No. 1, Sec. 9B.

Name ..... Title.....

Firm .....

City ..... Zone ... State.....

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SPRAGUE INTERFERENCE LOCATOR

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- Operates from self-contained dry batteries, automobile battery, or 115 volt mains.
- Features include loop and collapsible rod antennas, built-in loudspeaker, built-in dual range output and battery test meter, calibrated r-f and audio gain controls, and beat frequency oscillator.

Write for Bulletin PF-601

SPRAGUE ELECTRIC COMPANY

North Adams, Mass.

CATALOGS • BULLETINS

● NEW CATALOGUE ON PHONOGRAPHS, TRANSCRIPTION PLAYERS AND SOUND SYSTEMS: A new eight page, two-color catalogue illustrating and describing the fifteen 1953 models of Califone phonographs, transcription players and sound systems has just been released by the Califone Corporation, 1041 North Sycamore Avenue, Hollywood 38, California. Accompanying the catalogue is a combined specification and price sheet for easy selection of equipment to fit the customer's requirements.

● LABORATORY EQUIPMENT: A thorough and complete pamphlet on laboratory equipment has been prepared and is now available. Units such as attenuation networks, decade resistance boxes and individual resistance units, volume level indicators, transmission measuring sets, noise and distortion meters, output power meters, are completely detailed with pictures, descriptive copy, technical data and diagrams as to type, specifications and impedances. Requests for this informative pamphlet should be addressed to The Daven Company, Dept LE, 191 Central Avenue, Newark 4, New Jersey.

● NEW PNEUMATIC CONTROLLER: A new catalog now ready for distribution describes a completely new P-4 Pneumatrol Pneumatic Controller for rate of flow, differential pressure, liquid level, viscosity, pressure, and temperature applications. This controller is usable for either single or dual instrument case mounting and for point-of-measurement installation as well. The catalog describes in detail the action and components of this controller. Copies of Catalog C-50 may be obtained free of charge by writing Fischer & Porter Company 6890 Jacksonville Road, Hatboro, Penna.

● OILER CATALOG: The Eynon-Dakin Co, 9900 Freeland Ave, Detroit 27, Michigan, has just announced the availability of their new Oiler Catalog. This new bulletin illustrates and gives complete engineering data on their HY-Car oilers, standard oilers—vents—caps—special tube forms, etc, that they are currently manufacturing and have in stock. A new modern factory has made it possible for EDCO to increase their production 300%—greatly expand their lines, and produce in large volume all forms of special oil tubes, oil lines and special tube forms. Copies are available.

● PLANT LOCATION: To aid company management and engineers in the selection of the one location for a new plant that will offer the best combination of factors affecting total production cost, Walter Kidde Constructors, Inc, engineers and builders, has published a brochure entitled "Factors Influencing Industrial Plant Location." The 12-page, 8½ x 11 in. publication is a compilation of 64 basic questions which management must answer and evaluate in order to select the best site for a new plant. Copies of the brochure are available on request to the company that is mentioned above, 140 Cedar Street, New York 6, New York.

● MICROWAVE EQUIPMENT: DeMornay-Bonardi, Inc, Los Angeles, California, manufacturers of microwave equipment announced a unique catalog combining the additional features of a textbook and manual. The new volume is 134 pages of technical information on one of the most important electronic fields —microwave engineering. Eleven opening pages of the catalog graphically explain the basic concepts to microwaves. Including charts, graphs and drawings, this sec-

the Best in safety... wearability

KLEIN-KORD

nylon SAFETY STRAPS

Count on being really satisfied with Klein-Kord *nylon* Safety Straps. They're smooth and flexible, require no special care—and give you that important extra margin of safety. Made of multiple plies of strong, finely woven *nylon*, bonded together with frictioning and vulcanized in neoprene. Red center is a safety signal to "Stop When You See Red!" Equipped with finest drop-forged hardware.

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Foreign Distributor: International Standard Electric Corp., New York

KLEIN *Nylon* CLIMBER STRAPS for calf and ankle also available. Special straps furnished with rivets, burrs and punched for quick attachment to ring type climbers.

Write for your free copy of the Klein Pocket Tool Guide today!

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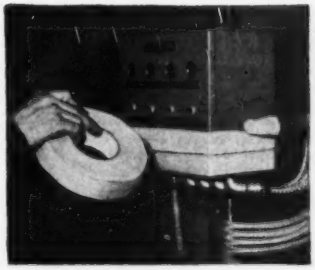
How to TAPE THE WRINKLES Out of Shipfitting

Ship Builder Finds Polyken Tapes Save Time and Money

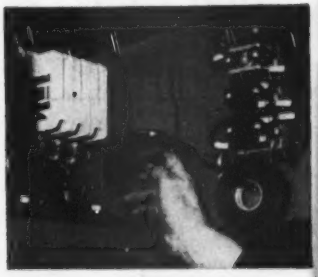
The S.S. Spartan, 420-foot car ferry, nearing completion in Christy yards.

MANY of the shipfitting jobs on car ferries, freighters and LST boats in the Christy Corp. yard at Sturgeon Bay are being done better, faster and for less money since the Wisconsin firm switched to Polyken tapes.

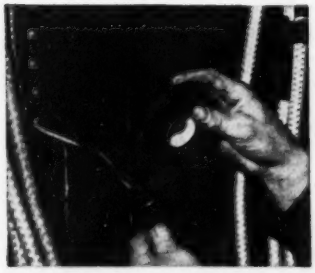
Polyken tapes can solve your tape problems, too, for there are well over 100 pressure-sensitive tapes in the Polyken line, each one tailored to a specific industrial need. Send for free samples and booklet today.



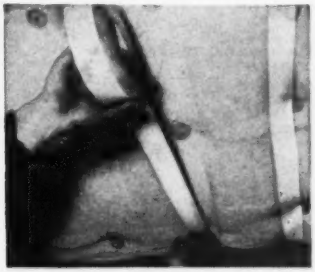
50% faster cleanup on interior painting jobs was achieved by switching from paper masking tape to Polyken No. 110—an economical easy-handling tape that gives unusually fast, clean pull-off.



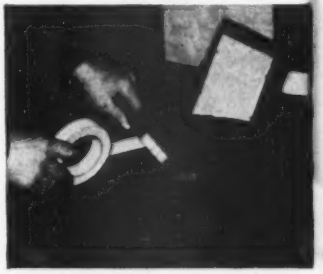
High-tension cables and leads in ferry's motor control center are spliced and wrapped with Polyken No. 822 in half the time required to apply rubber splicing compound and outer wrapping of friction tape.



Old-fashioned friction tape has been replaced by Polyken Electrical Tape No. 163 for less bulky, less expensive taping of leads, and for holding and bundling jobs on wires in ship's meter control center.



Excellent tensile strength and adhesive properties of Polyken Tape No. 223 anchor batts of hull and ceiling insulation in place before areas are covered with acoustic-type paneling by carpenters.



Heat-resistant insulation of turns in coils of welding machines is secured by using No. 290, the Polyken glass-fiber tape with thermo-setting adhesive. No. 290 withstands heat that destroys normal insulations.

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INDUSTRIAL TAPES

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PLUGMOLD 2000 with SNAPICOIL by WIREMOLD

TIME-SAVING FEATURES

Installing multiple convenience outlets is a real "snap" with Plugmold 2000 and Snapicoil! You *snap* the receptacles into the cover and *snap* the cover into the base—a few simple snap-over fittings complete the job! Takes minutes instead of hours.

Write today for new, free Plugmold 2000 book!

PLUGMOLD 2000

WIREMOLD'S *New* multi-outlet system

THE WIREMOLD COMPANY
Hartford 10, Connecticut

tion enables the engineer to fully understand the principles behind the microwave equipment. On the 21 succeeding pages, eleven phases on microwave test equipment measurements and calibration procedures are illustrated with easy-to-read, well-labeled drawings. Copies are available now upon request to the company.

● SINGLE STAGE CENTRIFUGAL COMPRESSORS: A well-illustrated, 12-pg bulletin on American Blower's line of Single Stage Centrifugal Compressors has been released. The bulletin covers functions, applications, ratings, features of design, arrangment and methods of control. If you desire a copy of this helpful bulletin, write to American Blower Corporation, Detroit 32, Michigan, and request Bulletin #109 on Centrifugal Compressors. Thin Locknuts: Thin locknuts, which meet or exceed in many instances minimum Army-Navy tensile requirements.

● REFERENCE CATALOG: Publication of a 16-page, illustrated "Quick Reference" catalog, describing American Flexible Metal Hose and Tubing, was announced by the manufacturers, The American Brass Company. These products are made in two basic types: seamless and strip wound. Catalog shows wide range of available alloys and sizes, suggested applications, and furnishes data on hose and fittings. Engineering information is also included. Available free of charge. Ask for Catalog CC-400. Write the company Waterbury 20, Conn.

● FIRE EXTINGUISHING SYSTEMS (AUTOMATIC): New twelve page catalog, graphically presents manual, mechanical, and automatic-electric carbon dioxide fire extinguishing System protection for spray booths, baking ovens, quench and dip tanks, paint and flammable liquid storage rooms, power rooms, generators and engine compartments. It explains System Blueprint Service, complete illustrations of detectors, warning alarms, timer-delays, motor and fan shut-off switches, door and window closers, remote pull-box releases, explosion proofing, and other automatic fire controls. Write for Catalog SYS-821, Randolph Laboratories, Inc., Systems Division, 8 E. Kinzie Street, Chicago, Illinois.

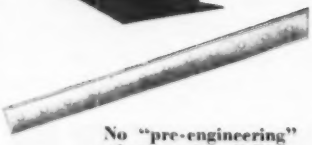
● ELECTRICALLY OPERATED VALVE: Information on industrial applications of Atkomatic Solenoid Valves is now available in the form of bulletins. Atkomatic Solenoid Valves are available for pressures up to 3,000 pounds per square inch. Adjustable timing on the closing stroke is available to pressures of 300 pounds per square inch. This feature eliminates shock on supply lines, particularly on hydraulic operations. Atkomatic Solenoid Valves are packless, easily maintained, and are designed to handle hydraulic operations, oil, water, steam, air, gases and any media not harmful to bronze. Bulletins deal with individual applications such as hydraulic operations, steam, air, gas and show typical operating diagrams. Atkomatic Valves are manufactured by The Atkomatic Valve Co, 545 West Abbott Street, Indianapolis, Indiana, and are distributed nationally through representatives in most cities coast to coast.

● OXIDE RECTIFIER STACKS: A new 8 page, two-color booklet describing the basic characteristics and applications of copper-oxide rectifier stacks has been announced as available from the General Electric Co. Schenectady 5, N. Y. Designated as GEA-5699A, the booklet is complete with charts, graphs, and tables illustrating the characteristics, manufacture, circuit design, and application of copper-oxide rectifiers.

EASIER TO INSTALL

PLUGMOLD 2000 with SNAPICOIL by WIREMOLD

CUTTING and FITTING reduced to a minimum



No "pre-engineering" when you install Plugmold 2000 multiple convenience outlets . . . every step you take gets the job done! . . . Plenty of knockouts for feeding and mounting in Plugmold 2000 base—no drilling! . . . You can feed in at any convenient point—no special fittings required! . . . Elbow fitting covers snap on and *overlap*—no precision cutting required!

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WIREMOLD'S *New* multi-outlet system

THE WIREMOLD COMPANY
Hartford 10, Connecticut

BOOK REVIEWS

Clock Repairing

Practical Clock Repairing. **By Donald deCarle. Published by N.A.G. Press Ltd, London, England. Distributed in U.S. by Henry Paulson & Co, Chicago, Ill. 240 pages, illustrated. Price $7.50.**

Clock movements being extensively used in electrical instrumentation, this book should have value in utility meter departments. Not that it even mentions time switches or graphic meter drives, but that it covers types of escapements, gear trains, all aspects of the mechanics of timekeeping from the standpoint of the repairman.

Quite aside from its usefulness in the trade of clock fixing, the book with its many illustrations has definite fascination for those amateurs who find relief from desk work in tinkering with that old clock and making it keep perfect time again.

Electronics

Storage Tubes. **By M. Knoll and B. Kazan. Published by John Wiley & Sons, Inc, New York 16. 143 pages. Price $3.00.**

Storage tubes are increasingly important elements of computer and signal-converter applications. This book explains the action of the many types in simple physical terms without mathematics. How the writing, storage, reading and erasure are achieved is detailed. Television tubes are reserved for the closing section of this informative book.

Nuclear Physics

Theoretical Nuclear Physics. **By J. M. Blatt and V. M. Weisskopf. Published by John Wiley & Sons, Inc, New York 16. 864 pages, illustrated. Price $12.50**

At the outset it is safe to say that no engineer who learned what he knows about physics before 1932 would be likely to understand this book. Nuclear physics belongs to the ensuing decades. The treatment is mathematical and analytical rather than experimental. Nor is any specific attention given to nuclear fission as a source of released energy. The focus is on binding energies, stability of the nucleus, influence of electric and magnetic fields, decays and transitions, etc.

It will be discovered that the physicist knows little tangible yet about internal mechanics of the nucleus and thus had to rely on empirical correlation. However, if the trick of converting nuclear energy directly into practical electrical energy is ever found the clue will probably arise from the analysis here. Anyhow the reader will be intrigued by the candid admission that stability of nuclei is associated with the "magic" numbers 2, 8, 14, 20, 28, 50, 82, 126. The whyfor is left largely unanswered.

Uniform System of Accounts

The Plant Accounting Regulations of the Federal Power Commission, A Critical Analysis. **By Sidney Davidson, John Hiplins University. Published by the Bureau of Business Research, School of Business Administration, University of Michigan, Ann Arbor, Mich. 163 pages. Price $2.00**

Although complimentary of the Federal Power Commission "in its efforts to secure effective regulation of natural monopolies" and their success "in making accounting a far more useful tool", Professor Davidson feels that there are some excesses in this direction. He has critically analyzed the application of the original cost rate base and the accounting principles used in its determination.

Professor Davidson presents arguments favoring a more lenient treatment of purchased services from associated companies. He also proposes that the cost of all elements of presently useful plants previously charged to expense be included in "original cost".

On the other hand, the treatment of interest during construction and initial losses are thought to be normal risk expenses not chargeable to the rate base.

Professor Davidson's observations are thought-provoking and worth careful analysis by commissioners and accountants in the public utility field.

Production, Transmission and Utilization of Power

Proceedings of the American Power Conference. **Published by Illinois Institute of Technology, Technology Center, 3300 South Federal Street, Chicago 16, Ill. 483 pages. Illustrated. Price $6.00**

This new book entitled The Proceedings of the American Power Conference presents a significant picture of current progress in the field of production, transmission and utilization of power. Not only are the interests of mechanical and electrical engineers represented in the material but also those of the sales manager, rate analyst, public and industrial relations executives and other management men.

It is significant that the program committee of the American Power Conference brought together the leaders in many branches of the power industry to discuss the important problems and trends of the day. The discussions of the developments of investor-owned utilities were given primary importance on the program. This is significant in itself and helps to balance the volumes of federal government propaganda grossly over emphasizing the contributions of government subsidized projects. Leaders like George M. Gadsby, then president of the Edison Electric Institute, Pressly H. McCance, president of AEIC and Philip Sporn, president of American Gas and Electric Company are representative of the speakers on general subjects.

Technical subjects were handled by men of equal ability and industry prominance. Important current developments in the fields of hydro and steam generation, transmission and distribution system design, and construction, industrial power and related subjects of special interest to utility engineers were covered.

This book should be a treasured possession and a regular reference of every utility man who aspires to broadening his knowledge in the field of his present employment.

Health

Health Resources in the United States. **By George W. Bachman and Associates, published by The Brookings Institution, Washington, D. C. 344 pages, illustrated. Price $5.00**

Factual data on health problems along with information on health services gives this book special value to medical people and personnel workers in all industry. A chapter on Health Service in Industry provides data on current activities and experience in this field. This section provides the statistical information to compare a company's own activities and experiences with others of equal size.

Characteristic of other Brookings Institution publications, this an essential book for anyone interested in the health field.

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1 RACEWAY FOR 3 WIRING SERVICES

1 TO LINE

For the first time, ONE raceway that's designed to take all 3 wiring services — NEMA grounded.

2 TO LINE

2-wire Duplex "hot", and 3-wire Duplex receptacles, *one side switched, one side "hot"* . . . cheaper, because only 1 raceway needs to be taken to the job!

3 SWITCH

. . . cheaper, too, because the pre-wired Snapicoil receptacles are readily intermixed or replaced by the skilled electrician . . . cheaper because cutting and fitting are reduced to a minimum.

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PLUGMOLD 2000

WIREMOLD'S *New* multi-outlet system

THE WIREMOLD COMPANY
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We Can Make
YOUR POLES
LAST LONGER
AND LONGER...
AND LONGER...
AND LONGER...
WITH AN
OSMOSE
INSPECTION AND
TREATING PROGRAM
This program, performed by our highly skilled crews, can save your system hundreds of thousands of dollars in REPLACEMENT COSTS by
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3431 BAILEY AVE. BUFFALO 12, N. Y.

TECHNICAL LITERATURE

Wiring Systems—A new 24 page booklet, "Safety Mineral Insulated Wiring System", has just been made available by General Cable Corporation. It contains a complete history and a detailed explanation of the many outstanding characteristics and applications of this new wiring system. Photographs of some recent installations are included as well as a partial list of users. For information write the company, 420 Lexington Ave, New York 17, N. Y.

Product Index—To familiarize salesmen from other companies with Ansul and its products, the Ansul Chemical Company has just published a booklet describing the company and its products, and listing names of any personnel to be seen. Intended for distribution in the reception room, while the visiting salesman is waiting, the booklet extends a welcome to the visitor and offers a wide variety of information about the company. This includes office hours, names of the purchasing agents and their areas of jurisdiction, company officers and departmental heads, and other pertinent information. Information is also provided on how to obtain transportation to and from the company; and a map of the area is also shown.

Cable Operation—A joint report of the Committee on Power Distribution, Association of Edison Illuminating Companies and Transmission and Distribution Committee of the EEI covers operating experience with high voltage paper insulated cable, joints and terminations during 1949. Copies may be obtained from the EEI, 420 Lexington Ave, New York, N. Y.

New Products Index—A new all-products folder is now available from Lewis-Shepard, Watertown, Mass., manufacturers of the Line of Industrial Trucks. Incorporating the many new models, this two-color circular includes descriptions and photographs of basic units in the Mater line: electric fork trucks—models "E", "J" and "M", 5 models of the Jackstacker and a section on the new Jacklift Electric models. In the hand line: stackers, hoisters and working height lifters; skid platforms and storage racks; hydraulic and mechanical trucks; and basic models of several floor trucks are also included and fully illustrated. A copy may be obtained by contacting the local representative or by writing directly to the company.

Vertical and Horizontal Shaft Units—A completely new 48-page Herman Nelson Unit Heater Booklet describing both vertical and horizontal shaft units, is now available from the Heating and Ventilating Department, American Air Filter Co, Inc, Louisville, Kentucky. The booklet incorporates many new features not included in previous literature. Besides giving an accurate description of component parts and dimensions for both style heaters, expanded steam and hot water capacities are included. Steam capacities are now tabled up to 50 PSI at 50°, 60°, or 70° entering air. The hot water tables include capacities at 180° and 200°. 3570 may be obtained free of charge.

Microwave Communication—A new book on microwave communication has just been made available. It describes in detail the part played by IT&T research and development in effecting the rapid growth of microwave transmission the salient technical and economic advantages of the system and typical installation. For further information contact the International Telephone & Telegraph Corp, 67 Broad St, New York 4, N. Y.

Automatic Recording and Control of pH-Hydrogen Ion Concentration—Brown-Cambridge system for automatic recording and control of pH is described in new four-page data sheet. Sheet includes discussion of measuring system components adjustments for operation, as well as variations in recording and control systems for electric or pneumatic modes of control and single or multi-point record-

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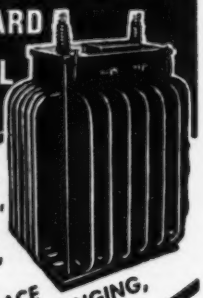
TRANSFORMERS
STANDARD • SPECIAL
AIR • OIL • WATER COOLED



POWER, LIGHTING, HEATING, WELDING, ELECTRIC FURNACE PHASE CHANGING, ETC.

¼ TO 500 KVA • UP TO 15,000 V.

EISLER Transformers are built strictly to N. E. M. A., A. S. A. and A. I. E. E. standards.

SEND FOR NEW CATALOG NO. TR-50

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Lumber Mills Electrical Equipment — Electrification of all processing operations in the lumber industry is described in a new 50-pg book now available. Standard and special equipment is described and application data is provided. Freely illustrated with on-the-job photographs, this book takes the reader on a tour of a typical lumber mill—stopping to describe some 21 phases of the application of electric power. For a copy of this book, B-5299, write Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Filler Metal—The latest specifications for filler metal, issued jointly by the American Welding Society and American Society for Testing Materials (AWS Designation A5.7; ASTM Designation B 259) covers copper and copper-alloy welding rods for use with oxy-acetylene, carbon arc and inert-gas metal-arc (nonconsumable electrode) welding. The twelve classifications established by these specifications include copper, silicon bronze, phosphor bronze, copper-nickel, naval brass, manganese bronze, low-fuming bronze, nickel bronze and aluminum bronze welding rods. As with the other filler metal specifications for copper-alloy electrodes and for steel and aluminum filler metal, these new specifications specify the chemical composition, mechanical properties and usability characteristics of each classification, with corresponding tests for verifying these properties. Copies of this can be obtained at 40 cents each from either American Welding Society, 33 West 39th St, N. Y. 18, N. Y., or American Society for Testing Materials, 1916 Race St, Philadelphia 3, Pa.

Microwave Equipment — DeMornay-Bonardi, Inc, Los Angeles, Calif., manufacturers of microwave equipment announces a unique booklet combining the additional features of a textbook and manual. The new volume is 124 pages of technical information on one of the most important electronic fields—microwave engineering. Eleven opening pages of the catalog graphically explain the basic concepts to microwaves. Including charts, graphs and drawings, this section enables the engineer to fully understand the principles behind the DeMornay-Bonardi microwave equipment. On the 21 succeeding pages, eleven phases on microwave test equipment measurements and calibration procedures are illustrated.

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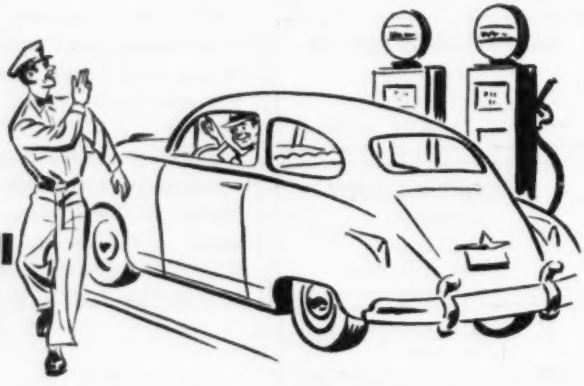

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4	200	G. E.	34500—230/460
3	100	West.	23000—240/480 NEW
3	100	A. C.	33000—7200/12470 Y
3	75	Wag.	33000—7200/12470 Y
4	450	A. C.	22410/44000—12200/23000
6	100	G. E.	22000—7200/12470 Y
9	50	G. E.	22000—2300
3	37½	G. E.	22000—6900
1	4000	Mel.	13800—460, 3 ph.
1	450	Penn.	13200—2400, 3 ph.
6	200	G. E.	13200—2300
3	200	G. E.	13200—230/460
1	3750	G. E.	11000—2300, 3 ph.
4	750	G. E.	11000—460
3	250	Pitts.	7200—220/440
3	150	Wag.	6900—2300
2	37½	G. E.	6900—230/460
2	100	G. E.	4800/2400—460/240
3	1500	A. C.	2300/4000 Y—2300
3	333	G. E.	2300—230/460
1	100	G. E.	2300—575, 3 ph.
6	50	West.	2400/1140—228 DRY TYPE
3	20	West.	2300—575

INDUCT. REGULATORS—OUTDOOR

1—140 KVA G. E. 200 A. 4000 V. 3 ph.
4—60 KVA West. 250/500 A. 2400 V. 1 ph.
6—48 KVA G. E. 200 A. 2400 V. 1 ph.
8—36 KVA West. 150/300 A. 2400 V. 1 ph.
2—36 KVA G. E. 75/150 A. 4800 V. 1 ph.

CIRCUIT BREAKERS

1—600 A. 73 KV G. E. FHKO-236-500 MVA
1—400 A. 37 KV G. E. FHKO-236-500 MVA
1—1200 A. 15 KV G. E. FHKO-139-350 MVA
4—800 A. 15 KV G. E. FHKO-139-750 MVA
1—600 A. 15 KV G. E. FHKO-136-250 MVA
1—400 A. 15 KV G. E. FHKO-136-350 MVA

BREW, WOLTMAN & CO., INC.
52 Church St. New York 7, N. Y.

OPPORTUNITIES!

in

New and used equipment recently released from service by a number of electric and gas utility companies

POWER PLANT EQUIPMENT
CONSTRUCTION EQUIPMENT
SUBSTATION EQUIPMENT
TRANSMISSION LINE
MATERIALS

Send for new list, . . . to

EBASCO SERVICES INCORPORATED
(APPARATUS EXCHANGE)
Two Rector St., New York 6, N. Y.

TURBO GENERATOR
Available Immediately
7500 KW G.E. Cr.
180 P.S.I.—325°F Total Temp.
3 phase 60 cycle 2300 volt
With Surface Condenser
GOOD CONDITION
Union Electric Co. of Missouri
315 N. 12th Blvd. St. Louis 1, Mo.

FROM AVAILABLE STOCK

TURBO GENERATORS

Qu	KW	Make	Desc.
1	—6000	Al. Ch.	Condensing 200/250 I.S.P. 2300 v 3/60 Exc & Surf cc Cond.
1	—750	G.E.	Condensing — 425 lbs. 750 TT I.S.P. 440 v 3 ph. 60 cy.— Built 1944
1	—500	Moore	Non-condensing 150/200 lbs I.S.P. 5.35 lbs. G.B.P 3, 60/480 volt Direct Connected Exciter
1	—400	Westg.	Non-condensing — 125/150 lbs. I.S.P. 5/10 lbs. B.P.— 240/480 v. 3 ph. 60 cy.
1	—300	G.E.	Non-condensing 150/175 I.S.P. 5/10 B.P.— 480 v. 3 ph. 60 cy.

SYNCHRONOUS CONDENSERS

KVA	Make	Type	Volts	Speed
1—5000	Whse.		2400/4150	600

MOTOR GENERATOR SETS
3 ph, 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
1—	2000	G.E.	514	600	6600/13200
2—	2000	G.E.	600	600 25 cy.	11000
1—	1000	G.E.	720	600	13200
1—	1500	G.E.	360	275	2300/4400
3—	1500	G.E.	514	250	6600/13200
1—	1000	G.E.	900	250	2300/4150
3—	1500	G.E.	600	600	2300/4150
2—	1000	Whse.	900	600	2300/4158
1—	500	Whse.	900	250	6600/13200
1—	500	Whse.	1200	125/250	2300
1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
1—	350	G.E.	900	125	4150
1—	150	G.E.	1200	275	2300
1—	150	Whse.	1200	275	2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
2—1250	G.E.	HVDDJ		6600x550
1—1150	A.C.	OISC		13200x480 2400
5—1000	G.E.	HVDDJ	1	2300x480
9— 300	G.E.	HT	3	24000x240/480

BELYEA COMPANY, INC.
OFFICE & SHOP
51 Howell St., Jersey City 6, N. J.

DIESEL POWER

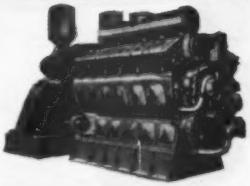
FOR

IMMEDIATE SHIPMENT

UNIT CAPACITIES—10 TO 1875 KVA

A.C.—50 AND 60 CYCLES

VARIOUS VOLTAGES



A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM	KW	Make	Model	HP	RPM
1138	Fairbanks Morse	38D	1600	720	320	Enterprise	DSG-6	460	450
1100	General Motors	16-278A	1600	720	300	General Motors	8-268A	450	1200
1000	General Motors	16-567B	1440	720	300	General Motors	8-268A	380	900
750	General Motors	12-567	1080	720	100	General Motors	3-268A	150	1200
600	General Motors	8-278A	750	720	100	Worthington	BB-6	150	600
600	General Motors	8-567	720	720	90	General Motors	6-71	90	1200
350	Baldwin	VO-6	510	450	50	Internat'l Harvester	UD-14	45	1200
330	Buckeye	80	480	600					

D.C. UNITS ALSO AVAILABLE

A. G. SCHOONMAKER COMPANY, INC.
ENGINE DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

160th Lilac St. North Bergen, N. J. N.Y.C. Tel. LOngacre 5-1277 N. J. Tel. Union 3-7500

TRANSFORMERS

1—1500 KVA G.E., 3 Ph., 4150V, 2300V Pyranol
2— 750 KVA G.E., 3 Ph., 4150V, 120/240V, sec.
2— 400 KVA Pitts., 1 Ph., 2400/4800V pri. 240/480V sec.
3— 333 KVA Whse., 1 Ph., 2400V, 600 V sec.
2— 200 KVA G.E., 3 Ph., 4150V, 120/240V, sec.
1— 200 KVA G.E., 3 Ph., 2400-2200 Sec.

SYNCHRONOUS MOTORS

1— 300 H.P., Elec. Mach., 720 RPM, 3 Phase 60 cyc., 2200V T E F Cooled Outdoor service.
1— 150 H.P., G.E., 1800 RPM, 220V.
2— 150 H.P., Al. Chal. 360 RPM, 440V.

MOTOR GENERATOR SETS

1—1000 KW G.E., 600 V, 514 RPM, 4000V Sn.
1— 200 KW Whse., 275V, 900 R.P.M., 220 V Syn.
1— 175 KVA West. 1Ph., 220V, Motor 3Ph., 440V.
1— 150 KW G.E., 125/250V, 1200 RPM, 2300 Syn.
1— 100 KW G.E., 250V, 500 RPM, 2300V, Syn.
1— 75 KW C.W. 230V, 1200RPM, 2300/4150V Syn

SLIP RING MOTORS

1— 400 H.P., West. CW, 450 RPM 550V.
1— 250 H.P., West., CW, 600 RPM, 440V.
1— 200 H.P., West., CW, 600 RPM, 440V.
1— 100 H.P., G.E., MT 600 RPM 440V.
1— 60 H.P., G.E., 1M 400 RPM 440V.

Large Stock of A.C. and D.C. Equipment

FOR SALE

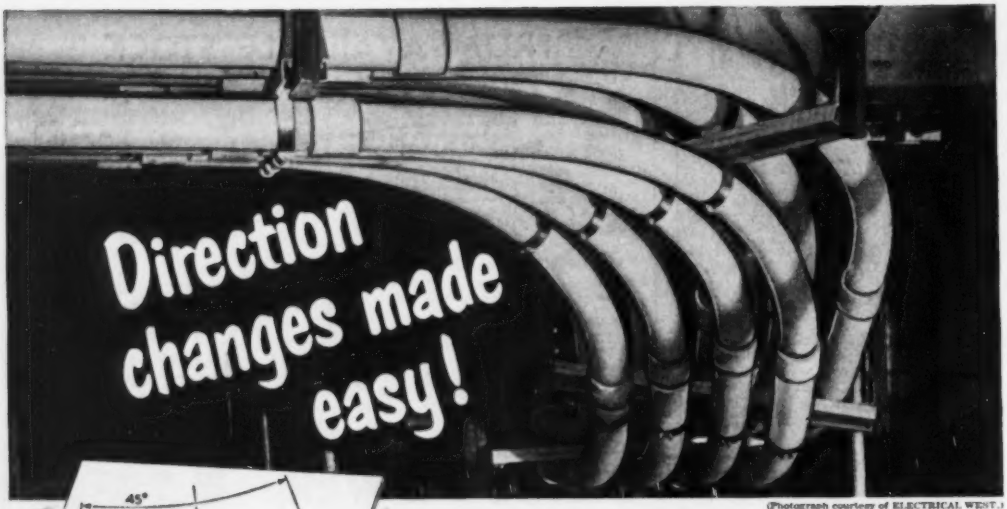
COMPLETE 4200 KW DIESEL ENGINE GENERATOR PLANT

Consisting of 5—1000 HP Busch Sulzer Diesel Engines, Type 8-DB-24, 257 RPM, each with direct connected 700 KW Electric Machinery Company Generator, 2300 V. and accessories. Average running time on each of the sets approximately 37,000 hours.

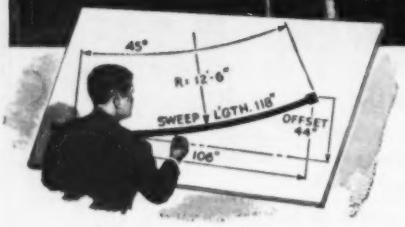
and 1—1000 HP Worthington Engine, Type EE8, 16 x 20 cyl., 327 RPM with direct connected 700 KW Electric Machinery Company Generator, 2300 volt and accessories. Running time approximately 22,000 hours.

Above equipment complete and in excellent condition. Can be inspected in operation under load conditions at Chippewa Falls, Wisconsin.

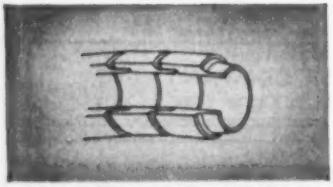
Inquire at: **DAIRYLAND POWER COOPERATIVE**
La CROSSE, WISCONSIN



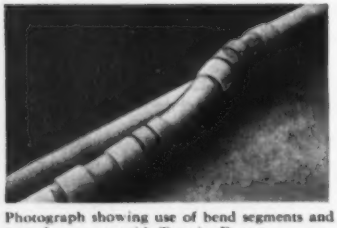
(Photograph courtesy of ELECTRICAL WEST.)



. . . with standard fittings for TRANSITE asbestos-cement DUCTS



5° bend segment sketched in detail. It consists of a straight section of Transite stock with a male taper on one end and a female taper on the other . . . each machined at an angle of 2½° to the center axis. Segments can thus be used single, or combined to form bend sections whose curvature is any multiple of 5°.



Photograph showing use of bend segments and curved segments with Transite Ducts.

When you use Transite Ducts, you have available a wide variety of standard fittings, made of the same asbestos-cement material as the ducts themselves. These fittings save time and expense because they provide maximum flexibility in laying out or constructing a duct system. They facilitate clearing unexpected obstructions or accommodating revisions in the original layout.

For instance, the new Transite 5° Bend Segments (shown at left) can be used alone to form simple and complex curvatures of any multiple of 5°. Used with other standard Transite curved fittings, they form curvatures of odd degrees. Thus, they enable you to simplify cross-overs and transformations . . . to clear obstructions . . . to form unusual or special bend or offset sections. They eliminate the need for purchasing special radii bends or sweeps.

The other standard Transite fittings that facilitate directional changes are the offset bends, standard 45° and 90° bends, sweeps, curved segments, laterals, tees, elbows and deflection couplings. These fittings are machined to a standard taper so that they can be used with Transite Conduit, Transite Korduct or with other Transite fittings.

For more information, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, address 199 Bay Street, Toronto 1, Ontario.

5 OTHER REASONS WHY TRANSITE DUCTS DO A BETTER JOB AT LESS COST:

1. Corrosion-Resistant. Transite, being made of inorganic asbestos and cement, resists corrosion and is immune to electrolysis.

2. Permanently Smooth Bore. Transite makes long cable pulls easy, under any conditions. Danger of damage to cables is also minimized.

3. Incombustible. Transite will not burn or contribute to formation of smoke, gases, fumes. It confines burnouts, will not soften under heat.

4. Higher Thermal Conductivity. Cables run cooler in Transite, reducing I^2R losses, increasing current capacity and prolonging insulation life.

5. Easy to Install. Transite Ducts are light weight, easy to handle. Joints are quickly made. Long 10-foot lengths reduce number of joints in line.

Johns-Manville TRANSITE® DUCTS

JM PRODUCTS

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

5/8% Step Voltage Regulators

Get More Feeder Revenue NOW!

WHY LOSE REVENUE while waiting for overloaded feeders to be rebuilt? You can bring feeder voltage to maximum efficiency at low cost with Allis-Chalmers distribution regulators. And you'll be cutting out customer complaints due to low voltage.

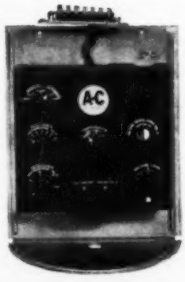
Best of all, these regulators give you low-cost insurance against poor voltage anywhere in your system. It's easy to shift regulators from feeder to feeder as needed — mounting and placing them in operation is simple and fast.

Call your nearest A-C district office to find out how you can increase revenue *now* with Allis-Chalmers distribution regulators. Or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3861

RATINGS AVAILABLE

7620 Volts—15, 50, 100 amp
5000 Volts—50, 100 amp
2500 Volts—100, 200 amp

Allis-Chalmers distribution regulator provides a narrow, accurate ± 1 volt band on a southeastern feeder.



Installation is Fast; Maintenance is Easy

"Feather-Touch" controls of Allis-Chalmers distribution regulators are one reason why installation is so fast and simple. There is only one adjustment to make: setting the voltage level. Voltage band is pre-set at the factory. A convenient calibrated scale plus a large, finger-fit knob makes setting the voltage level especially easy.

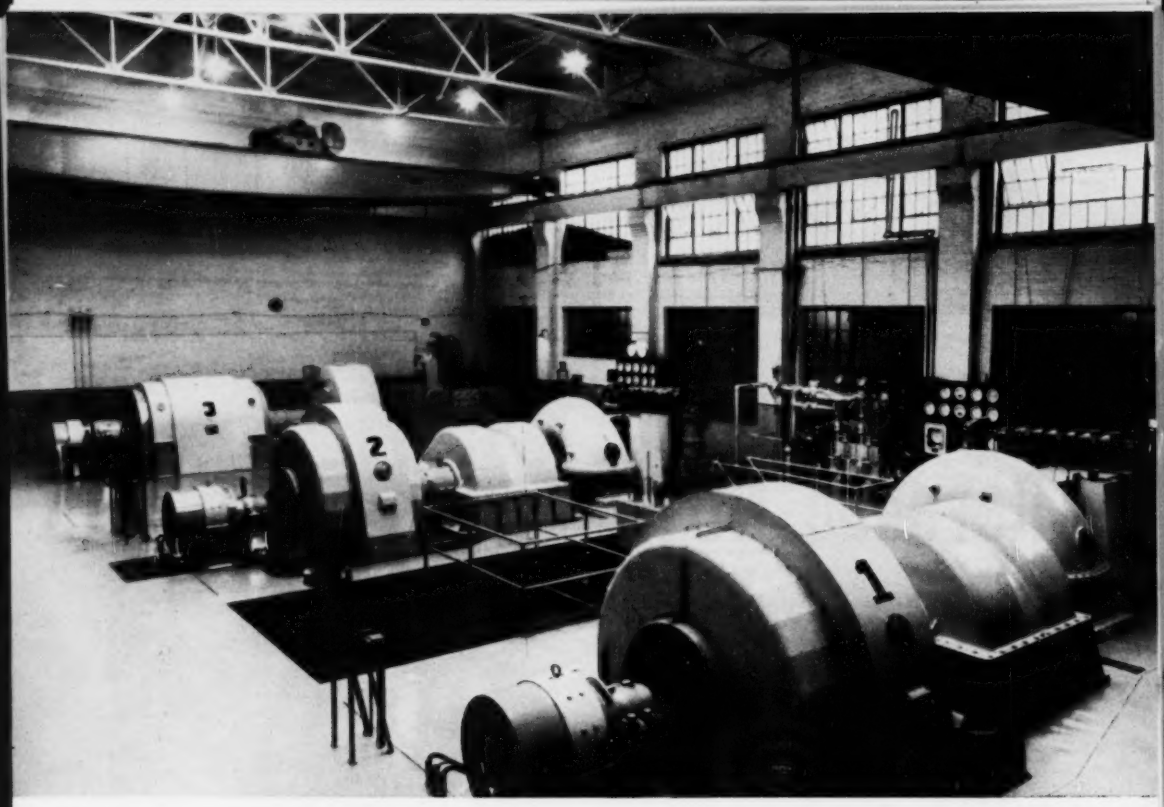
Maintenance is simplified by a single jack plug that connects all wiring to the regulator. The control can be removed and replaced in a short time. Your linemen don't have to be technical experts because the control can easily be sent back to the shop for a thorough checkup.

The complete story of "Feather-Touch" controls is contained in the booklet "Feather-Touch Controls on Allis-Chalmers Distribution Regulators," 01M7866-1. Write for it.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Originators of 5/8% Step Regulation



17-year record shows savings you can make with...

NONPAREIL
TRADE MARK
Turbine Oil

• Turbine oil changed every three years, oil systems cleaned every year, filters cleaned every four months . . . that was the oil system maintenance routine in the power plant of a mid-west paper mill before the switch was made to NONPAREIL Turbine Oil.

Recommended by a Standard Oil lubrication specialist, NONPAREIL has been used for 17 years in the plant's two 4,000-KW units and for 12 years in its 5,000-KW unit. The original fills of oil have never been removed from the turbines. Neutralization numbers have remained below 0.09 mg. KOH/gm. The oil systems have never needed cleaning.

While the lubricant and maintenance savings already realized by this power plant are impressive, they are just a beginning. Trouble-free lubrication and consequent savings are *assured for the life of these turbines.* This is based on the written guarantee, given with each fill of NONPAREIL, that this unique lubricant will last as long as the turbine, and that its neutralization number will stay below 0.15 mg. KOH/gm.

A Standard Oil lubrication specialist will be glad to show you record after record, each covering over 20 years' operation, where NONPAREIL has eliminated oil replacements, oil system cleaning, and troubles caused by excessive oil acidity. All you need do is phone your local Standard Oil (Indiana) office. Or, write Standard Oil Company, 910 South Michigan Ave., Chicago 80, Illinois.

STANDARD OIL COMPANY
(Indiana)

SO

STANDARD